انجمن ریاضی ایران

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The Guide and Abstracts

پنجاه و دومین کنفرانس ریاضی ایران

52nd Annual Iranian Mathematics Conference

Faculty of Mathematics and Computer
Shahid Bahonar University of Kerman
Kerman, Iran
30 August - 02 September 2021

دانشکده ریاضی و کامپیوتر
دانشگاه شهید باهنر کرمان
۸ تا ۱۱ شهریور ۱۴۰۰

https://aimc52.uk.ac.ir aimc52@conf.uk.ac.ir +98 34 33257280

Shahdad Kalouts, Kerman, Iran

کلوت‌های شهداد، کرمان

52nd Annual Iranian Mathematics Conference

Faculty of Mathematics and Computer &
Mahani Mathematical Research Center
Shahid Bahonar University of Kerman, Kerman, Iran

30 August- 02 September, 2021

The Guide and Abstracts

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Preface

It is our great pleasure and honor to welcome you at the 52nd Annual Iranian Mathematics Conference (AIMC52). The AIMC52 will be held on 30-31 August & 1-2 September 2021, hosted by the Faculty of Mathematics and Computer & Mahani Mathematical Research Center, Shahid Bahonar University of Kerman (SBUK), Iran.

The Faculty of Mathematics and Computer of SBUK began its activities in 1995 and currently faculty has five departments: pure mathematics, applied mathematics, mathematics education, statistics and computer science. It has 56 faculty members, 59 doctoral, 143 master's degree and 618 undergraduate students. The members of the faculty are also active in the Mahani Mathematical Research Center located on campus. The mathematics department of the university was established in 1975 and is, in fact, one of the oldest mathematics departments in the country. It began offering a master's program in 1984 and doctoral program in 1988 and it is a matter of great pride that the first three doctorates in mathematics in Iran were awarded to graduates of this department. The faculty, and especially the mathematics department, were also instrumental in the award of the first honorary doctorate degree in mathematics in 2002 to the late Professor Parviz Shahriari, one of the pioneers of mathematics education in Iran.

The Iranian mathematics conferences are yearly events, the first conference being held in 1970. Each year a university in the country volunteers to host the conference together with the Iranian Mathematical Society (IMS). Mathematicians, researches and graduate students from around the world have attended these conferences where they have presented papers and participated in discussions. SBUK hosted the 13th conference in 1982 and has been the host and organizer of this conference every 13 years since then. This year (2021), the faculty of mathematics and computer of SBUK has the honor to organize the 52nd conference.

The AIMC52 received 548 submissions in that each submission was reviewed by some reviewers and one dedicated members of the Scientific Committee. Finally, 345 submissions

were accepted for presentation: 251 as oral presentations and 94 as posters. We are proud to present a very interesting program. The conference program included 4 plenary talks, 12 invited talks with distinguished speakers, two panels, two workshops, and annual gathering of women.

Finally, we immensely thank the authors for submitting their research papers to the AIMC52, and are grateful to the members of the Scientific Committee for dedicating their attention and time to assessing the papers. We are also very thankful to the members of the Executive Committee for their efforts in the arrangement, promotion, and organization of the conference.

Conference Organizing Committee

General Information

We would like to inform you that in order to attend the seminar virtually, you are required to install either Adobe Connect or Adobe Flash Player on your device. For devices using *Windows*, *MacOS*, *Android*, and *iOS*, you can install the above-mentioned applications by clicking on this link. Then, please take the following steps to enter the meeting:

1. Open the Adobe Connect,
2. Copy and paste the related link (for example, http://aimc52.ir/main), and then press the Continue button,
3. Type your name as a guest and enter the room.

Moreover, we should mention that

1. The details and related links of the Seminar programs can be seen at https://aimc52.uk.ac.ir.
2. Only the Plenary and Invited Talks are presented in English, and the sessions Opening, Closing, Parallel Lectures and Posters are presented in Persian.
3. The duration of each Plenary Talk is 60 minutes and 30 minutes for questions.
4. The duration of each Invited Talk is 45 minutes and 15 minutes for questions.
5. The duration of each Lecture is 15 minutes and 5 minutes for questions.
6. Each Poster is only presented for 30 minutes.
7. The Opening and Closing will be at the link M.
8. The Plenary and Invited Talks will be at the links M or Z.

9. The Lectures will be at the links T1, T2, T3, T4, T5, T6 and T7.
10. The Posters will be at the links P1, P2, P3, P4, P5, P6 and P7.
11. The Break and Networking will be at the link B.
12. The Meeting will be at the link M.
13. The Annual Gathering of Women will be at the link M.

For any questions or information, please contact the Seminar Secretariat on the details below:

Website: https://aimc52.uk.ac.ir

Contact Email: aimc52@conf.uk.ac.ir

Contact Phone: 03433257280

Address: Faculty of Mathematics and Computer & Mahani Mathematical Research Center, Shahid Bahonar University of Kerman, Kerman, Iran

Address Links:

Link M: https://online1.uk.ac.ir/c_main
Link Z: https://us06web.zoom.us/j/88257919679 **Meeting ID:** 882 5791 9679

Link T1: https://online1.uk.ac.ir/c_talk1
Link T2: https://online1.uk.ac.ir/c_talk2
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Plenary Talks

1. Prof. David Eisenbud, University of California, Berkeley, USA
2. Prof. Esfandiar Eslami, Shahid Bahonar University of Kerman, Iran
3. Prof. Dusa McDuff, Barnard College, Columbia University, USA
4. Prof. Curtis Tracy McMullen, Harvard University, USA

Invited Talks

1. Prof. Rama Cont, University of Oxford, England
2. Prof. Hamid Reza Ebrahimi Vishki, Ferdowsi University of Mashhad, Iran
3. Prof. Behnam Hashemi, Shiraz University of Technology, Iran
4. Prof. Milan Hladik, Charles University, Prague, Czech Republic
5. Prof. Ramin Javadi, Isfahan University of Technology, Iran
6. Prof. Boris Mordukhovich, Wayne State University, USA
7. Prof. Witold Pedrycz, University of Alberta, Canada
8. Prof. Cheryl Elisabeth Praeger, University of Western Australia
9. Prof. Mohammad Safdari, Sharif University of Technology, Iran
10. Prof. Laure Saint-Raymond, University of Lyon, France
11. Prof. Siamak Yassemi, University of Tehran, Iran

Conference Program

Timetable

(Iran Daylight Time (GMT+4:30))

Time	August 30
8:15 AM - 10:30 AM	Opening
10:30 AM - 11:00 AM	Break and Networking
11:00 AM - 12:30 AM	Plenary Talk
12:30 AM - 2:00 PM	Lunch Break
2:00 PM - 3:00 PM	Invited Talk
3:05 PM - 4:15 PM	Parallel Lectures
4:15 PM - 4:30 PM	Break and Networking
4:30 PM - 6:30 PM	Parallel Lectures
6:30 PM - 7:00 PM	Break and Networking
7:00 PM - 8:00 PM	Invited Talk
8:00 PM - 8:15 PM	Break and Networking
8:15 PM - 9:45 PM	Plenary Talk

Timetable

(Iran Daylight Time (GMT+4:30))

Time	August 31	September 1	September 2
8:00 AM - 9:00 AM	Invited Talk	Invited Talk	Invited Talk
9:05 AM - 10:15 PM	Parallel Lectures	Parallel Lectures	Parallel Lectures
10:15 AM - 10:30 AM	Break and Networking		
10:30 AM - 12:30 AM	Parallel Lectures	Parallel Lectures	Parallel Lectures
12:30 AM - 1:30 PM	Lunch Break		
1:30 PM - 2:00 PM	Parallel Posters	Parallel Posters	Parallel Posters
2:00 PM - 3:00 PM	Invited Talk	Invited Talk	Invited Talk
3:05 PM - 4:15 PM	Parallel Lectures	Parallel Lectures	Parallel Lectures
4:15 PM - 4:30 PM	Break and Networking		
4:30 PM - 6:30 PM	Panel	Annual Gathering of Women	Panel
6:30 PM - 7:00 PM	Break and Networking		
7:00 PM - 8:00 PM	Invited Talk	Invited Talk	Invited Talk
8:00 PM - 8:15 PM	Break and Networking		
8:15 PM - 9:45 PM	Plenary Talk	Plenary Talk	Closing

Day 1: Monday, August 30

(Iran Daylight Time (GMT+4:30))

Time	Title
8:15 AM - 10:30 AM	Opening
10:30 AM - 11:00 AM	Break and Networking
11:00 AM - 12:30 AM	Plenary Talk Esfandiar Eslami
12:30 AM - 2:00 PM	Lunch Break
2:00 PM - 3:00 PM	Invited Talk Laure Saint-Raymond
3:05 PM - 4:15 PM	Parallel Lectures
4:15 PM - 4:30 PM	Break and Networking
4:30 PM - 6:30 PM	Parallel Lectures
6:30 PM - 7:00 PM	Break and Networking
7:00 PM - 8:00 PM	Invited Talk Rama Cont
8:00 PM - 8:15 PM	Break and Networking
8:15 PM - 9:45 PM	Plenary Talk Curtis T. McMullen

Day 2: Tuesday, August 31

(Iran Daylight Time (GMT+4:30))

Time	Title
8:00 AM - 9:00 AM	Invited Talk Hamid Reza Ebrahimi Vishki
9:05 AM - 10:15 AM	Parallel Lectures
10:15 AM - 10:30 AM	Break and Networking
10:30 AM - 12:30 AM	Parallel Lectures
12:30 AM - 1:30 PM	Lunch Break
1:30 PM - 2:00 PM	Parallel Posters
2:00 PM - 3:00 PM	Invited Talk Milan Hladik
3:05 PM - 4:15 PM	Parallel Lectures
4:15 PM - 4:30 PM	Break and Networking
4:30 PM - 6:30 PM	Panel
6:30 PM - 7:00 PM	Break and Networking
7:00 PM - 8:00 PM	Invited Talk Witold Pedrycz
8:00 PM - 8:15 PM	Break and Networking
8:15 PM - 9:45 PM	Plenary Talk David Eisenbud

Day 3: Wednesday, September 1

(Iran Daylight Time (GMT+4:30))

Time	Title
8:00 AM - 9:00 AM	Invited Talk Behnam Hashemi
9:05 AM - 10:15 AM	Parallel Lectures
10:15 AM - 10:30 AM	Break and Networking
10:30 AM - 12:30 AM	Parallel Lectures
12:30 AM - 1:30 PM	Lunch Break
1:30 AM - 2:00 PM	Parallel Posters
2:00 PM - 3:00 PM	Invited Talk Cheryl E. Praeger
3:05 PM - 4:15 PM	Parallel Lectures
4:15 PM - 4:30 PM	Break and Networking
4:30 PM - 6:30 PM	Annual Gathering of Women
6:30 PM - 7:00 PM	Break and Networking
7:00 PM - 8:00 PM	Invited Talk Siamak Yassemi
8:00 PM - 8:15 PM	Break and Networking
8:15 PM - 9:45 PM	Plenary Talk Dusa McDuff

Day 4: Thursday, September 2

(Iran Daylight Time (GMT+4:30))

Time	Title
8:00 AM - 9:00 AM	Invited Talk Ramin Javadi
9:05 AM - 10:15 AM	Parallel Lectures
10:15 AM - 10:30 AM	Break and Networking
10:30 AM - 12:30 AM	Parallel Lectures
12:30 AM - 1:30 PM	Lunch Break
1:30 AM - 2:00 PM	Parallel Posters
2:00 PM - 3:00 PM	Invited Talk Mohammad Safdari
3:05 PM - 4:15 PM	Parallel Lectures
4:15 PM - 4:30 PM	Break and Networking
4:30 PM - 6:30 PM	Panel
6:30 PM - 7:00 PM	Break and Networking
7:00 PM - 8:00 PM	Invited Talk Boris S. Mordukhovich
8:00 PM - 8:15 PM	Break and Networking
8:15 PM - 9:45 PM	Closing

Abstract of
Plenary Talks

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Linearity in the resolution of monomial ideals

David Eisenbud*

Department of Mathematics, University of California, Berkeley, US

Abstract. A well-known theorem of Froeberg describes the square-free quadratic ideals with linear resolutions, and this was extended in a paper of mine with Mark Green, Klaus Hulek and Sorin Popescu to tell when the resolution is linear for the first few steps; but no such result is known for monomials of degree greater than 2. I will recall these results, and discuss some new results of Hai Long Dao and myself on the "opposite" case of primary monomial ideals.

*Speaker. Email address: de@math.berkeley.edu

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Logic and its necessity

Esfandiar Eslami*

Department of Pure Mathematics, Shahid Bahonar University of Kerman, Kerman, Iran

Abstract. In this talk, we first review some general definitions of logic. Their common aspects together with a short history of logic is given. We show how human thinking paradigms give rise to different logics. Some logics with special domains of their applications are discussed. Each logic has a set of inference rules. Using these rules correctly in appropriate domains, we get true logical results. Otherwise we fall in the trap of fallacies. Some very common fallacies are mentioned. At the end, we introduce some modern non-classical logics which are used in Artificial Intelligence (AI). We will emphasize on the needs of future goals of AI to appropriate logics.

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New developments in the symplectic embedding problem

Dusa McDuff*

Department of Mathematics, Barnard College, Columbia University, New York, US

Abstract. I will discuss the question of when a four dimensional symplectic ellipse embeds into a target manifold such as a ball or a blow up of the complex projective plane. I will explain some recent work (due to Cristofaro-Gardiner, Holm, Magill and Weiler, among others) that exhibits the close connections between this question and properties of Pell equations and continued fractions. The talk will be elementary, and accessible to nonspecialists.

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Billiards and Moduli Spaces

Curtis Tracy McMullen*

Harvard University, USA

Abstract. The moduli space Mg of compact Riemann surface of genus g has been studied from diverse mathematical viewpoints for more than a century. In this talk, intended for a general audience, we will discuss moduli space from a dynamical perspective. We will present general rigidity results, provide a glimpse of the remarkable curves and surfaces in Mg discovered during the last two decades, and explain how these algebraic varieties are related to the dynamics of billiards in regular polygons, L-shaped tables and quadrilaterals. A variety of open problems will be mentioned along the way.

*Speaker. Email address: ctm@math.harvard.edu

Abstract of
Invited Talks

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Stochastic Calculus Without Probability: An Analytical Viewpoint

Rama Cont*

Mathematical Institute, University of Oxford, England

Abstract. Stochastic calculus was introduced by Kiyosi Ito and developed by Kunita, Watanabe, Meyer as a calculus for functions of stochastic processes with irregular trajectories, using a probabilistic definition for the stochastic integral. However, Ito's calculus may be alternatively seen as a calculus for causal functionals of systems with rough trajectories. We show that the main ingredients of the Ito calculus may be developed in a purely analytical framework, free of any probabilistic ingredients or assumptions, and sketch the foundations of a causal functional calculus which extends the Newton-Leibniz differential calculus to functionals of systems with rough trajectories of arbitrary irregularity [1, 2].

[1] H Chiu, R Cont (2020) Causal Functional Calculus, https://arxiv.org/abs/1912.07951.

[2] R Cont, N Perkowski (2019) Pathwise integration and change of variable formulas for continuous paths with arbitrary regularity, Transactions of the American Mathematical Society (Series B), Volume 6, 161-186.

*Speaker. Email address: rama.cont@maths.ox.ac.uk

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Pure and Applied Mathematics: Confrontation or Interaction?!

Hamid Reza Ebrahimi Vishki*

Ferdowsi University of Mashhad, Iran

Abstract. The subject of comparing pure and applied sciences has long been discussed, and there have been different views on their interaction. In particular, this comparison has been in the spotlight by those who work in mathematics, and there are different ideas for convergence or confrontation of these two tendencies. Indeed, the question may be raised as to which one is the other prerequisite? Should pure mathematics be at the forefront of the applied one, and its direction be determined by applied research and industry needs? Or the problematic nature of knowledge requires that pure mathematics be developed as a product of free thought beyond its immediate applications, leading to expanding the frontiers of knowledge? In this talk, we first give a brief introduction to these two trends and ideas in describing the duties of pure and applied mathematicians. Then we will discuss the existing challenges (especially in Iran) and focus on the more comprehensive question: "Pure or applied mathematics? Or both?".

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Least-squares spectral methods for solving operator eigenvalue problems[1]

Behnam Hashemi*

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Abstract. We develop spectral methods for solving operator eigenvalue problems that are based on a least squares formulation of the problem. The key tool is a method for rectangular matrix pencils, which we extend to quasimatrices and objects combining quasimatrices and matrices. When applied to important eigenvalue problems like the standard Orr-Sommerfeld and Sturm-Liouville equations, the accuracy and speed of our methods are similar to typical spectral methods. The strength of the approach is its flexibility, allowing e.g. the basis functions to be chosen arbitrarily, and often giving high accuracy. It is particularly useful for solving challenging problems with boundary conditions depending affinely on the unknown spectral parameter. Such problems appear in a variety of applications e.g., in fluid and structural mechanics.

[1]This talk is based on joint work with Yuji Nakatsukasa (University of Oxford)

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Absolute value programming

Milan Hladik*

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Abstract. Absolute value programming is quite recent and intensively developing discipline. It refers to systems of equations and inequalities and to mathematical programming problems involving absolute values. We focus primarily on absolute value equations $Ax - b = |x|$, which is the most frequently studied problem in this area, but we will also mention some extensions. Due to their relation to the linear complementarity problem, absolute value equations highly attracted the optimization community. We will discuss not only this relation, but also computational complexity issues, the structure of the solution set, and connections to other areas of mathematics. Important questions are those addressing solvability; we will present various conditions for (unique) solvability or unsolvability. Since the discipline is relatively new, there are many open and challenging problems; we pose some of them, too.

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Expanding Properties of Graphs and its Applications in Ramsey Theory

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Abstract. Given a positive number α, a graph G on n vertices is called an α-expander if the size of the external neighborhood of every vertex set U of size at most $n/2$ is at least $\alpha|U|$. Expander graphs have been studied widely in the literature and are proved to have significant applications in a wide range of fields such as computer science, computational complexity and coding theory. It is well-known that binomial random graphs are good expanders with high probability. Also, building regular expanders and regular bipartite expanders with an explicit construction is a central and well-studied problem in the context. Recently, some structural properties of expanders are studied and it is proved that expander graphs contain some families of sparse graphs such as trees and cycles of different lengths as subgraphs. In this talk, we explore some of these properties of expanders and then we present some important applications of these properties in Ramsey theory. Given a graph G and an integer $r \geq 2$, the multicolor size-Ramsey number of G, denoted by $\hat{R}(G, r)$, is the smallest integer m such that there is a graph H with m edges for which, in every edge

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coloring of H with r colors, H contains a monochromatic copy of G. The problem of finding the value of the size-Ramsey number of sparse graphs such as paths, trees and cycles, initiated by Paul Erdős, is a long-standing and well-known problem in Ramsey theory. Using expanding properties of random graphs, we give some results regarding the size-Ramsey numbers of paths and cycles.

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Variational analysis: What is this about?

Boris Mordukhovich*

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Abstract. Absolute value programming is quite recent and intensively developing discipline. It refers to systems of equations and inequalities and to mathematical programming problems involving absolute values. We focus primarily on absolute value equations $Ax - b = |x|$, which is the most frequently studied problem in this area, but we will also mention some extensions. Due to their relation to the linear complementarity problem, absolute value equations highly attracted the optimization community. We will discuss not only this relation, but also computational complexity issues, the structure of the solution set, and connections to other areas of mathematics. Important questions are those addressing solvability; we will present various conditions for (unique) solvability or unsolvability. Since the discipline is relatively new, there are many open and challenging problems; we pose some of them, too.

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Interpretability and Explainability in Data Analytics: From Data to Information Granules

Witold Pedrycz*

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Abstract. In data analytics, system modeling, and decision-making models, the aspects of interpretability and explainability are of paramount relevance, just to refer here to explainable Artificial Intelligence (XAI). They are especially timely in light of the increasing complexity of systems one has to cope with. We advocate that there are two factors that immensely contribute to the realization of the above important features, namely, (i) a suitable level of abstraction along with its hierarchical aspects in describing the problem and (ii) a logic fabric of the resultant construct. It is shown that their conceptualization and the following realization can be conveniently carried out with the use of information granules (for example, fuzzy sets, sets, rough sets, and alike). Concepts are building blocks forming the interpretable environment capturing the essence of data and key relationships existing there. The emergence of concepts is supported by a systematic and focused analysis of data. At the same time, their initialization is specified by stakeholders or/and the owners and users of data. We present a comprehensive discussion of information granules-oriented design of concepts and their description by engaging an innovative mechanism of conditional

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(concept)-driven clustering. A detailed case study of enhancement of interpretability of functional rule-based models with the rules in the form "if x is A then $y = f(x)$". The interpretability mechanisms are focused on the elevation of interpretability of the conditions and conclusions of the rules. It is shown that augmenting interpretability of conditions is achieved by (i) decomposing a multivariable information granule into its one-dimensional components, (ii) their symbolic characterization, and (iii) linguistic approximation. A hierarchy of interpretation mechanisms is systematically established. We also discuss how this increased interpretability associates with the reduced accuracy of the rules and how sound trade-offs between these features are formed.

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Codes and designs in Johnson graphs[1]

Cheryl Elisabeth Praeger*

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Abstract. The Johnson graph $J(v,k)$ has, as vertices, all k-subsets of a v-set V, with two k-subsets adjacent if and only if they share $k-1$ common elements of V. Subsets of vertices of $J(v,k)$ can be interpreted as the block-set of an incidence structure, or as the set of codewords of a code, and automorphisms of $J(v,k)$ leaving the subset invariant are then automorphisms of the corresponding incidence structure or code. This approach leads to interesting new designs and codes. For example, numerous actions of the Mathieu sporadic simple groups give rise to examples of Delandtsheer designs (which are both ag-transitive and anti-ag transitive), and codes with large minimum distance (and hence strong error-correcting properties). In my talk I will explore links between designs and codes in Johnson graphs which have a high degree of symmetry, and I will mention several open questions.

[1]This talk is based on joint work with R. A. Liebler, M. Neunhoeffer, and more recently J. Bamberg, A. C. Devillers and M. Ioppolo

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Local and nonlocal equations with gradient constraints

Mohammad Safdari*

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Abstract. We consider the questions of existence and regularity of fully nonlinear local or nonlocal equations with gradient constraints, which appear in singular stochastic control problems. We do not assume any regularity about the constraints, so in particular they need not be strictly convex. We will also consider local or nonlocal double obstacle problems which naturally arise in this study.

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Dynamics of perfect gases: a statistical approach

Laure Saint-Raymond*

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Abstract. The evolution of a gas can be described by different models depending on the observation scale. A natural question, raised by Hilbert in his sixth problem, is whether these models provide consistent predictions. In particular, for rarefied gases, it is expected that statistical models of kinetic theory can be obtained directly from molecular dynamics governed by the fundamental principles of mechanics. In the case of hard sphere gases, Lanford showed that the Boltzmann equation corresponds indeed to the law of large numbers in the low density limit, at least for very short times. The objective of this survey is to present recent progresses in the understanding of this limiting process, providing a complete statistical description of these dynamical systems.

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Cohen-Macaulayness in a Fixed Codimension

Siamak Yassemi*

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Abstract. A concept of Cohen-Macaulay in codimension t is defined and characterized for arbitrary finitely generated modules and coherent sheaves by Miller, Novik, and Swartz in 2011. Soon after, Haghighi, Yassemi, and Zaare-Nahandi defined and studied CMt simplicial complexes, which is the pure version of the above mentioned concept and naturally generalizes both Cohen- Macaulay and Buchsbaum properties. The purpose of this talk is to survey a number of recent studies of CMt simplicial complexes. We focus on the Stanley-Reisner ring of a simplicial complex, the shape of the Betti diagram of the Stanley-Reisner ideal of a simplicial complex in special cases and the independence simplicial complex of a simple graph. In the final step, we introduce the CMt property for an unmixed monomial ideal of a polynomial ring. This research program has produced many exciting results and, at the same time, opened many further interesting questions and conjectures.

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Abstracts

Part 1: Talks

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Weighted composition operators from S^p spaces into Bloch spaces

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Abstract. In this paper we give conditions for the boundedness and compactness of weighted composition operators between spaces of functions with derivative in Hardy spaces and Bloch spaces. As a result we find similar conditions for composition operators and multiplication operators.

Keywords: Hardy spaces, Bloch spaces, Weighed composition operators

Mathematics Subject Classification [2010]: 47B38, 46E15, 30D55

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The use of artificial neural network (ANN) to simulate HIV infection model

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Abstract. In this work we implement an artificial neural network for the approximate solution of the mathematical model which describes the behavior of $CD4^+$ T-cells, infected $CD4+$ T-cells and free HIV virus particles after HIV infection. Also, the effect of constant and different variable source terms used for supplying the new $CD4+$ T-cells from thymus on the dynamics of $CD4^+$ T-cells, infected $CD4^+$ T-cells and free HIV virus are investigated.

Keywords: Artificial neural network, Ordinary differential equations, Numerical analysis

Mathematics Subject Classification [2010]: 65MX

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Simultaneously hard thresholding algorithms with feedbacks and partially known row support for multiple measurement vectors

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Abstract. In this paper, we introduce simultaneously hard thresholding feedbacks with partially known row support (SNST+HT+FB+PKRS) for solving Multiple Measurement Vector Problem (MMV). This method has higher accuracy than solving the problem by breaking it apart into independent Single Measurement Vector (SMV) problems and applying the hard thresholding feedbacks with partially known support (NST+HT+FB+PKS). Furthermore, we compare it with MMV Orthogonal Matching Pursuit (M-OMP), MMV Basic Matching Pursuit (M-BMP) and MMV FOCal Underdetermined System Solver (M-FOCUSS).

Keywords: Multiple measurement vector, Compressed sensing, Restricted isometry principle, Fast thresholding algorithm

Mathematics Subject Classification [2010]: 65F10, 65F50, 15A29

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A sparse two-greedy subspace Kaczmarz algorithm for compressed sensing

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Abstract. In this paper, we propose a two-greedy subspace Kaczmarz algorithm to solve the system of linear equations with sparse solution. This algorithm improves the convergence speed compared to randomized Kaczmarz algorithm. The speedup is obtained by projecting every iterate onto the solution space generated by greedily selected rows. Our numerical results demonstrate convergence speed for sparse recovery.

Keywords: Two greedy subspace Kaczmarz algorithm, Iterative hard thresholding algorithm, Compressed sensing

Mathematics Subject Classification [2010]: 65F10, 65F50, 15A29

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WENO-Z schemes based on the identification of extreme points for Hamilton-Jacobi equations

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Abstract. The aim of this work is to design a fifth-order WENO-Z scheme in the framework of finite difference for Hamilton-Jacobi (HJ) equations. By finding the extreme points of the reconstruction polynomial, the scheme (MWENO-Z) automatically adapts between the linear upwind scheme and a WENO-Z scheme. By comparing the numerical results of MWENO-Z and the classical WENO proposed by Jiang and Peng for HJ, the efficiency and robustness of MWENO-Z is appeared.

Keywords: WENO-Z scheme, Finite difference framework, Hamilton-Jacobi equation, Computational efficiency

Mathematics Subject Classification [2010]: 65M06, 35F21

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LB-valued operators on LB-valued GFA

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Abstract. In this paper, at first, we introduce the concepts of LB-valued general fuzzy automata and LB-valued operators with t-norm and LB-valued operators with t-conorm, where L stands for residuated lattice and B is a set of propositions about the GFA. Further, we study the relationships between the LB-valued operators with t-norm and the LB-valued operators with t-conorm.

Keywords: Operator, Norm, General fuzzy automata

Mathematics Subject Classification [2010]: 03D05, 20M35

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On the normality of matrix polynomials

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Abstract. A matrix polynomial $P(\lambda)$ is called weakly normal if for every $\mu \in \mathbb{C}$, the matrix $P(\mu)$ is normal. It is said to be normal if all the eigenvalues of $P(\lambda)$ are semisimple. In this note, by using invertibility of the Vandermonde matrix, it is proved that $P(\lambda)$ is weakly normal if and only if all its coefficients are normal and mutually commuting. The relation between normal and weakly normal matrix polynomials are studied and some results about the polynomial numerical hulls of the companion linearization of the matrix polynomial $P(\lambda) = \lambda^m I - A$ are given.

Keywords: Matrix polynomial, Companion linearization, Polynomial numerical hulls

Mathematics Subject Classification [2010]: 15A18, 15A60, 15A22

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Iteration operator frames and their relation to their dual

Elahe Agheshte Moghadam[1,*] and Ali Akbar Arefijamaal[1]

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Abstract. The purpose of the paper is to analyze frames $\{f_k\}_{k\in\mathbb{Z}}$ having the form $\{T^k f_0\}_{k\in\mathbb{Z}}$ for some bounded linear operator T. We characterize all dual frames which are representable in terms of iterations of an operator. Moreover, we show that under some condition a Parseval iteration operator frame has a unique iteration operator dual frame by the same operator.

Keywords: Iteration operator frames, Iteration operator dual frames, Parseval iteration operator frames

Mathematics Subject Classification [2010]: 42C15, 42C40

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Some results about Dedekind-finite acts over monoids

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Abstract. Dedekind-finite rings and modules are an interesting research in the theory of modules. In this talk, we introduce and study Dedekind-finiteness in the theory of acts over monoids. we will indicate when Dedekind-finiteness and cohopfian property are equivalent in the theory of acts over monoids. we present a powerful characterization of a quasi-injective act in terms of the endomorphisms of its injective envelope.

Keywords: *S*-act, Dedekind-finite, Injective envelope, Cohopfian

Mathematics Subject Classification [2010]: 20M30, 20M50, 08B25

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Group algebras satisfying some normalized Laurent polynomial identities

Masoumeh Akbari-Sehat[1,*] and Mojtaba Ramezan-Nassab[1]

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Abstract. Let FG be the group algebra of a group G over a field F of characteristic $p \neq 2$. In this talk we discus on Laurent polynomial identity of $\mathcal{U}(FG)$, the unit group of FG. Particularly, we show that if G is torsion and $\mathcal{U}(FG)$ satisfies a normalized Laurent polynomial identity, then FG satisfies a polynomial identity. For a non-torsion group G, we also provide some necessary conditions for unit group of semiprime FG to satisfy a normalized Laurent polynomial identity.

Keywords: Laurent polynomial identity, Group algebra, Group identity, Engel group

Mathematics Subject Classification [2010]: 16R50, 16S34, 16U60

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Mathematical analysis of a novel Japanese encephalitis fractional model

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Abstract. Japanese encephalitis (JE) is a mosquito-borne disease that causes encephalitis mostly in children in Asia and livestock. In this paper, a new fractional model of JE transmission involving the general form of Caputo derivative is proposed. This model emphasis on the environmental effects on the aquatic phase of mosquitoes. Basilar properties of the new model including the equilibrium points and the basic reproduction number are considered. Moreover, a product-integration-based numerical method is established to solve and implement the new model.

Keywords: Japanese encephalitis, Fractional model, PI rule, Numerical simulation

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On the Laplacian spectrum of the comaximal graph of $\mathbb{Z}_n$

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Abstract. Assume that R is a commutative ring. The comaximal graph of R, denoted by $\Gamma(R)$, is a simple graph whose vertex set consists of all elements of R, and two distinct vertices a and b are adjacent if and only if $Ra + Rb = R$. In this paper, we investigate the Laplacian spectrum of the comaximal graph of the ring $\mathbb{Z}_n$.

Keywords: Comaximl graph, Laplacian spectrum

Mathematics Subject Classification [2010]: 05C50, 13A70

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Generalized projective dimension and the generalized intersection theorem

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Abstract. Let R be a commutative Noetherian ring, M a finitely generated R-module and $\mathfrak{a}$ be an arbitrary ideal of R. For an arbitrary integer $k \geq -1$, we introduce a generalization of projective dimension named the k-projective dimension denoted by $k\text{-pd}_R M$. The finite k-projective dimension of M is at least $k\text{-depth}(\mathfrak{a}, R) - k\text{-depth}(\mathfrak{a}, M)$. If N is a finitely generated R-module, in certain conditions, it is shown that $\dim N \leq k\text{-}\operatorname{pd}_R M$ which is a generalization of the Intersection Theorem.

Keywords: Local cohomology modules, Generalized projective dimension, The Auslander-Buchsbaum formula, The generalized intersection theorem

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Dynamics of a fractional SIR model with two different fractional derivatives

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Abstract. In this paper, an SIR model with fractional derivatives in the sense of Caputo and Caputo-Fabrizio definitions is introduced. The dynamical properties of the system analyzed and some simulations are presented to verify the analytical results. For simulation of the system with the Caputo derivative, we use the predictor-corrector method of Adams-Bashforth-Moulton and for the Caputo-Fabrizio fractional model, we use the three-step Adams-Bashforth predictor method.

Keywords: SIR epidemic model, Caputo derivatives, Caputo-Fabrizio derivatives, Adams-Bashforth predictor method

Mathematics Subject Classification [2010]: 26A33, 34K37

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Hardness Results of k-Efficient Domination in Chordal Graphs

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Abstract. A set $D \subseteq V$ of a graph $G = (V, E)$ is called an efficient dominating set of G if every vertex v has exactly one neighbor in D, in an alternative view, the vertex set V is partitioned to some circles with radius one such that the vertices in D are the centers of partitions. A generalization of this concept, introduced by Chellali et al. citeChellali, is called k-efficient dominating set that briefly is partitioning the vertices of a graph with different radiuses. It leads to a partition set $\{U_1, U_2, \ldots, U_t\}$ such that each U_i consists a centre vertex u_i and all the vertices in distance d_i where $d_i \in \{0, 1, \ldots, k\}$. The problem of finding minimum set $\{u_1, u_2, \ldots, u_t\}$ is called the Minimum k-efficient domination problem. Given a positive integer S and a graph $G = (V, E)$, the k-efficient Domination Decision problem is to decide whether G has an k-efficient dominating set of cardinality at most S. The k-efficient Domination Decision problem is known to be NP-complete even for bipartite graphs [1]. Clearly, every graph has a k-efficient Dominating set, but it is not correct for efficient dominating set. In this paper, we study the NP-completeness of the k-efficient domination problem in Chordal graphs.

Keywords: Efficient domination, Computational complexity

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On the epi-superfluous submodules

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Abstract. Let R be a ring. In this paper, we introduce epi-superfluous R-submodules and epimorphism radical of an R-module which are larger than that of superfluous submodules and radical of an module, respectively. Then we examine some characteristics of these submodules on epi-Notherian and epi-Artinian modules. Various examples are also given.

Keywords: Epi-Superfluous submodule, Epi-Artinian module, Epi-Notherian module

Mathematics Subject Classification [2010]: 16D10, 16D99, 13C13

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Option pricing in the fractional stochastic volatility models using malliavin calculus

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Abstract. We study the fractional stochastic volatility model in which the volatility is driven by a fractional Brownian motion and the price is driven by an independent simple Brownian motion. We relate the option price to a quadratic average of the exponential fractional Brownian motion and We prove the existence of the Implied Volatilities distribution density function by using malliavin calculus and we derive the asymptotics of the mentioned average as t tends to infinity

Keywords: Fractional stochastic volatility model, Volatility smile, Call option pricing, Asymptotics of the distribution density, Malliavin calculus

Mathematics Subject Classification [2010]: 60G22, 91G20, 60H07

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Mean-square stability analysis of a stochastic Runge-Kutta scheme for stiff Ito SDE systems

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Abstract. In this paper, we investigate the mean-square stability analysis of a stochastic Runge-Kutta (SRK) schemes for stiff SDE systems of Ito types. In this class the schemes which are not fully implicit, while appropriate for stiff SDEs. For a subclass of these schemes with stochastic weak second order, the mean-square stability (MS-stability) is analysed.

Keywords: Stiff stochastic differential equations, Mean-square stability, Stochastic Runge-Kutta

Mathematics Subject Classification [2010]: 65L04, 60H10 ,65C30 ,37H30

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Some results on torsion and extension functors

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Abstract. In this paper we generalize the Zero Divisor Conjecture and Rigidity Theorem for k-regular sequence. For this purpose for any k-regular M-sequence $x_1, \ldots, x_n$ we prove that if $\dim \operatorname{Tor}_2^R(\frac{R}{(x_1,\ldots,x_n)}, M) \leq k$, then $\dim \operatorname{Tor}_i^R(\frac{R}{(x_1,\ldots,x_n)}, M) \leq k$, for all $i \geq 1$. Also we show that if

$$\dim \operatorname{Ext}_R^{n+2}(\frac{R}{(x_1,\ldots,x_n)}, M) \leq k,$$

then $\dim \operatorname{Ext}_R^i(\frac{R}{(x_1,\ldots,x_n)}, M) \leq k$, for all integers $i \geq 0$ $(i \neq n)$.

Keywords: k-regular sequence, Extension functor, Zero divisor conjecture

Mathematics Subject Classification [2010]: 13D45, 13D07

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A class of almost L*-Dunford-Pettis sets in Banach lattices

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[2]Department of Mathematics, Farhangian University, Iran

Abstract. We introduce the concepts of L*–Dunford–Pettis and almost L*-Dunford-Pettis sets in Banach lattices. We obtain some characterizations of them with respect to some well known geometric properties of Banach spaces, such as, weak Dunford-Pettis property, strong relatively compact Dunford-Pettis property and almost Dunford-Pettis completely continuous operators on such Banach lattices. abskeywordsDunford–Pettis set, relatively compact Dunford-Pettis property (DP$_{rc}$P), almost Dunford-Pettis set, strong DP$_{rc}$P.

Keywords: Dunford–Pettis set, Relatively compact Dunford-Pettis property (DP$_{rc}$P), Almost Dunford-Pettis set, Strong DP$_{rc}$P

Mathematics Subject Classification [2010]: 46A40, 47L20, 46B28

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Finite one-step plus unitary rings are commutative

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Abstract. As a generalization of one-step rings we define “one-step plus rings" as one-step rings such that all of their subrings (of the same structure or not) are commutative. In this paper we show that finite one-step unitary rings are commutative. As a generalization of one-step rings we define “one-step plus rings" as one-step rings such that all of their subrings (of the same structure or not) are commutative. In this paper we show that finite one-step unitary rings are commutative.

Keywords: One-step ring, Unitary ring, Division ring

Mathematics Subject Classification [2010]: 16P10, 17C60

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Stability and Hopf bifurcation in a diffusive predator-prey system with Holling type II response

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Abstract. In this paper, stability and Hopf bifurcation in a diffusive predator-prey system are discussed. The interaction term is Holling type II. The local behavior is first discussed for the corresponding homogeneous system. Then, the diffusive system's linear stability is discussed around a homogeneous equilibrium state followed by bifurcations in the infinite-dimensional system. By choosing a proper bifurcation parameter, we prove that a Hopf bifurcation occurs in both the homogeneous and nonhomogeneous systems. We compute the normal form of this bifurcation up to the third order and obtain the direction of the Hopf bifurcation. Finally, we provide numerical simulations to illustrate our analytical conclusions.

Keywords: Stability, Hopf bifurcation, Reaction-diffusion system, Predator-prey model

Mathematics Subject Classification [2010]: 35K57, 92D25, 70K50

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On symmetries of the Riemannian manifold $\mathbb{H}^2 \times \mathbb{R}$

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Abstract. In this article, we study the existence of Killing and affine vector fields on the Riemannian manifold $\mathbb{H}^2 \times \mathbb{R}$. We also classify the matter collineations of this manifold. In this article, we study the existence of Killing and affine vector fields on the Riemannian manifold $\mathbb{H}^2 \times \mathbb{R}$. We also classify the matter collineations of this manifold.

Keywords: $\mathbb{H}^2 \times \mathbb{R}$ Riemannian metric, Affine vector field, Matter collineation

Mathematics Subject Classification [2010]: 58D17, 53B20

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A numerical scheme to solve the nonlinear time-fractional stochastic beam equation

Afshin Babaei[1], Hossein Jafari[1] and Sayede Sedigheh Banihashemi[1,*]

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Abstract. In this paper, we employ a spectral collocation method based on Legendre polynomials (LPs) to solve the nonlinear time-fractional stochastic beam equation (NTFSBE). This method is applied to convert the solution of NTFSBE to the solution of a nonlinear system of algebraic equations. The numerical approach is completely described. Finally, a test example is implemented to validate the robustness of the proposed scheme.

Keywords: Fractional calculus, Stochastic beam equation, Legendre collocation scheme

Mathematics Subject Classification [2010]: 35R60, 60H35, 35R11

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Numerical solution of an inverse diffusion-convection problem based on the Chebyshev-collocation method

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Abstract. In this work, we consider an inverse diffusion-convection problem with an unknown function in the boundary condition. Since, in the sense of stability, this inverse problem is generally ill-posed, a mollification regularization technique is utilized. Then, a sixth-kind Chebyshev-collocation method will be introduced to solve the resulted mollified problem. At the end, to validate the accuracy of the proposed method a numerical example is investigated.

Keywords: Inverse problem, Diffusion-convection equation, Collocation method, Mol-lification technique

Mathematics Subject Classification [2010]: 35R30, 65M70, 41A50

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New Runge-Kutta algorithm for a HIV/AIDS epidemic fractional order model

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Abstract. In this paper, fractional order model for one of the newest models of the HIV/AIDS transmission is introduced. We develop four stage Runge-Kutta Method for the proposed fractional model and some main properties are investigated. Numerical solutions are compared with the real data, happened in Cape Verde Islands. The results show the fractional model is more successful than the integer model and also, the Runge-Kutta algorithm provides better approximate solutions than some other methods such as Adams type predictor-corrector technique.

Keywords: HIV/AIDS transmission model, HIV infection, Fractional derivatives, Numerical algorithms

Mathematics Subject Classification [2010]: 92C60, 34C60, 65L06

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A stable hybridized discontinuous Galerkin method to solve the two-dimensional Burgers equation

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Abstract. In this paper, to solve the two-dimensional Burgers equation numerically, a hybridized discontinuous Galerkin (HDG) method is introduced and for time discretization the backward Euler method is used. In addition, we prove that under special conditions on stability parameters, the proposed HDG method is stable. By examining a numerical example, the optimal convergence for approximate solution is found and the performance of the method for high Reynolds numbers is shown.

Keywords: Two-dimensional Burgers equations, Hybridized discontinuous Galerkin method, Sstability analysis

Mathematics Subject Classification [2010]: 65M60, 65M12

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Groups with few p-parts of co-degrees of irreducible charact

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Abstract. For a character χ of a ïňĄnite group G, the number $\chi^c(1) = \frac{[G:\ker\chi]}{\chi(1)}$ is called the codegree of χ. Let p be a prime and let e be a positive integer. In this talk, we ïňĄrst show that the p-parts of co-degrees of non-principal irreducible characters of G are same and only if G is an elementary abelian p-group. Next, we show that if G is a p-solvable group such that $p^{e+1} \nmid \chi^c(1)$, for every irreducible character χ of G, then the p-length of G is not greater than e. Finally, we study the ïňĄnite groups satisfying the condition that p^2 does not divide the co-degrees of their irreducible characters.

Keywords: Co-degree of a character, p-length, p-solvable group

Mathematics Subject Classification [2010]: 20C15, 20D10, 20D05

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Relative N-Weight codes over direct product of finite chain rings

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Abstract. In this paper, we study a relative N-weight linear codes over $R_1^{\alpha} \times R_2^{\beta}$, where R_1 and R_2 are finite chain rings. We introduce the concept of relative N-weight code over $R_1^{\alpha} \times R_2^{\beta}$ as a generalization of one- weight and two- weights codes. It is shown that the Gray image of N-distance of relative N-weight is a N-distance code and that the Gray image of a relative N-weight code is a linear relative N-weight code.

Keywords: Codes over chain rings, Linear code, Gray image, Relative N-weight code

Mathematics Subject Classification [2010]: 94B60, 94B05, 94B25

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On the lattice of fuzzy filters of quantales

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Abstract. The notion of an $\mathcal{L}$-fuzzy filter in a quantale is introduced. After that some properties are given, using the notion of a closure operator, the lattice structure of these substructures is studied. Particularly, it is shown that this lattice is a complete Brouwerian lattice and so is a complete Heyting lattice.

Keywords: Quantale, $\mathcal{L}$-fuzzy filter, Lattice

Mathematics Subject Classification [2010]: 03G12, 08A72, 03E72

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Preconditioning methods for weighted Toeplitz regularized least-squares problems

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Abstract. We consider two types of block preconditioners and the corresponding iterative methods for the solution of the weighted Toeplitz least-squares problems. We show that the proposed iterative methods are convergent unconditionally. These two preconditioners can be used to accelerate the convergence rate of the Krylov subspace methods. Numerical results are given for GMRES.

Keywords: Least-squares problems, Weighted Toeplitz matrix, Preconditioner

Mathematics Subject Classification [2010]: 65F10, 65F08

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Pretty clean monomial ideals

Somayeh Bandari*

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Abstract. Let $S = K[x_1, ldots, x_n]$ be a polynomial ring over a field K. In this paper, we give some results for sum, product and colon of clean (pretty clean) monomial ideals. We also generalize Soleyman Jahan's result from monomial ideals with at most 3 variables to monomial ideals with number of arbitrary variables. Indeed, we prove that if $I = uJ$ is a monomial ideal of S, where u is a monomial in S, and J is a monomial ideal of height ≥ 2, then I is pretty clean if and only if J is pretty clean.

Keywords: Pretty clean, Clean, Monomial ideals, Simplicial complex, Shellable

Mathematics Subject Classification [2010]: 13F20, 13F55, 05E40

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Characterization of generalized matrix Banach algebras

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Abstract. In this paper, the Banach algebras which can be assumed as generalized matrix Banach algebras will be characterized. Then we show that there is a Banach algebra A which can not be assumed as a triangular Banach algebra, but $H^1(A, A) = 0$. This example gives a negative answer to the open question raised by Bennis and Fahid "Does the condition $H^1(A \oplus X, A \oplus X) = 0$ imply that $A \oplus X$ has a triangular matrix representation?"

Keywords: Banach algebra, Idempotent, Generalized matrix Banach algebra

Mathematics Subject Classification [2010]: 46H25, 46M18

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Construction of space-time block codes based on Abelian algebras

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Abstract. Space-time block codes (STBC) provide a model for transmission over Rayleigh fading channels using multiple transmit antennas. Several design criteria have been proposed to design STBCs for MIMO channels. The rank and determinant criteria are suggested to design full-rate and full-diversity STBCs. Division algebras are powerful tools that provide full diversity for STBCs. This paper gives a method for constructing STBCs using Abelian division algebras which can be embedded as a subalgebra in the matrices over complex numbers with an explicit embedding formula.

Keywords: STBC, Full diversity, Crossed product algebra, Division algebra, Finite Abelian group

Mathematics Subject Classification [2010]: 14K05

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M-ideals in MV-algebras

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Abstract. In this paper M-ideals has been introduced and their properties have been studied. In addition, we provide equivalent conditions for it. We examined their relationship to the minimal prime ideals. It is also shown that every prime ideal of an MV-algebra contains a minimal prime ideal. We studied their behavior under homomorphisms on MV-algebra

Keywords: MV-algebra, Maximal ideal, M-ideal

Mathematics Subject Classification [2010]: 06D35, 06B10

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A classification of 2-designs admitting flag-transitive automorphism groups

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Abstract. In this talk, we give a classification of 2-designs admitting flag-transitive automorphism groups. Here, we present a recent achievement on a classification of 2-designs with $\gcd(r, \lambda) = 1$ admitting flag-transitive automorphism groups which states that all such 2-designs are known except for those admitting one dimensional affine type automorphism groups.

Keywords: 2-design, Flag-transitive automorphism group, Primitive group

Mathematics Subject Classification [2010]: 05B05, 20B25, 05B25

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On Minty variational inequality with generalized approximate convexity

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Abstract. We extend the notion of approximate convexity for set-valued mappings, then we defined approximate efficient solution for perturbed vector optimization optimization and hence, we defined approximate efficient solution for Minty variational inequality. We obtain relation between approximate efficient solution for optimization problem and approximate efficient solution for Minty variational inequality.

Keywords: Approximate efficient solution, Approximately convexity, Minty variational inequality

Mathematics Subject Classification [2010]: 47J30, 30H05, 46A18

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A generalized Wilcoxon test for multivariate central symmetry

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Abstract. We propose a new class of tests for central symmetry around a known point based on the center-outward depth ranking. The asymptotic distribution of the proposed tests under the null distribution is derived. This class includes the celebrated Wilcoxon signed-rank test as a special case in the univariate setting. For illustration, we apply the tests to a well-known data set to illustrate the method developed in this paper.

Keywords: Depth function, Central symmetry, Wilcoxon signed-rank test

Mathematics Subject Classification [2010]: 62H15, 62G10

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Some new characterizations of inner product spaces in terms of HH-I-orthogonality

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Abstract. In this study, we consider Hermite-Hadamard type of isosceles orthogonality (HH-I-orthogonality) in normed linear spaces. We prove that the existence property of HH-I-orthogonality in the sense of Alonso and Benitez. In conclusion, some new characterizations of real inner product spaces in terms of HH-I-orthogonality and its relationship with Birkhoff-James orthogonality are presented.

Keywords: Birkhoff-James orthogonality, Hermite-Hadamard type of isosceles orthogonality, Inner product space, Strictly convex normed linear space

Mathematics Subject Classification [2010]: 46B20, 46C05

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A two-step cubic regularization algorithm to solve unconstrained optimization problems

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Abstract. The current paper studies an improved adaptive cubic regularized method to solve the unconstrained minimization problems. This work is focused on the adaptive regularization algorithm using cubics. we present a two-step version of adaptive cubic regularization algorithm for unconstrained optimization problems. The global convergence analysis is investigated under appropriate conditions. Several numerical results are given to illustrate the efficiency and robustness of the suggested method.

Keywords: Unconstrained optimization, Cubic regularization, Trust region method

Mathematics Subject Classification [2010]: 90C30, 49M37, 65K05

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Partially projective modules and locally partially free sheaves

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Abstract. In this paper, the notions of partially projective modules and locally partially free sheaves are introduced. These notions are generalizations of projective modules and locally free sheaves respectively, and have some interesting properties in common with projective modules and locally free sheaves. As in the Serre-Swan theorem, the relationship between partially projective modules and locally partially free sheaves is obtained.

Keywords: Faithful surjection, Partially projective module, Partially free module, Locally partially free sheaf

Mathematics Subject Classification [2010]: 13C10, 13C13, 14A15

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A numerical method for the two-asset Black-Scholes PDE

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Abstract. In this paper, an efficient hybrid numerical method for solving two-asset option pricing problem is presented based on the Crank-Nicolson and the radial basis function methods. For this purpose, the two-asset Black-Scholes partial differential equation is considered. Also, the convergence of the proposed method are proved and implementation of the proposed hybrid method is specifically studied on Call on maximum Rainbow options. In addition, this method is compared to the explicit finite difference method as the benchmark and the results show that the proposed method can achieve a noticeably higher accuracy than the benchmark method.

Keywords: Two-asset option pricing, Black-Scholes equation, Radial basis functions

Mathematics Subject Classification [2010]: 91G80, 65M06, 65M12

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Reconstructing image from noisy radon projections using shearlet transform

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Abstract. The Radon transform on the two-dimensional space, called X-ray transform, is reviewed. Some methods to reconstruct an X-ray image from its sinogram are investigated. Important details are lost when the shearlet transform is used to retrieve an image from its noisy Rdadon data. We present a new theorem to relate the shearlet and Radon transforms to come up with this challenge. An optimum threshold to use is obtained. The algorithm of fast finite shearlet transform is improved, and numerical results show the notable superiority of the proposed method over other existing algorithms.

Keywords: X-ray Transform, Shearlet Transform, Image Reconstruction, Noisy Data

Mathematics Subject Classification [2010]: 44A12,92C55

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Non-total imprisonment and Lorentzian length spaces

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Abstract. A sufficient and a necessary condition for non-total imprisonment on Lorentzian length spaces is given. Some properties of these kind of length spaces are investigated. In addition it is proved that any non-totally imprisoning locally causally closed and d-compatible Lorentzian length space which contains a lightlike line is causally disconnected.

Keywords: Length space, Non- total imprisonment, Ligthlike line

Mathematics Subject Classification [2010]: 53C23, 53C50, 53B30

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Adaptive integrated radial basis function method for time dependent partial differential equations

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Abstract. The integrated radial basis function (RBF) method is a universal mesh-free method for the numerical solution of partial differential equations. Both global and local forms of this method achieve a higher order of accuracy. In this paper, we take advantage of the mesh-free property of the methods and use an adaptive algorithm to choose the location of the collocation points. An adaptive algorithm is used for Burgers equation and it is shown that it leads to high accuracy with fewer collocation points.

Keywords: Integrated radial basis function, Adaptive technique, Burgers equation

Mathematics Subject Classification [2010]: 65M50, 65L50

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Nonlinear stochastic differential equations and novel operational matrix method

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Abstract. A novel operational matrix of the integral operator with respect to the variable-order fractional Brownian motion is applied to solve nonlinear stochastic differential equations. In addition, the convergence of the new method is investigated. Finally, the accuracy and efficiency of the new method are confirmed by solving a well-known model.

Keywords: Variable-order fractional Brownian motion, Stochastic differential equations, Generalized hat functions, Stochastic operational matrix

Mathematics Subject Classification [2010]: 60H10, 60G22, 65G99

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On the existence of strictly positive doubly stochastic operators

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Abstract. Let $p \in [1, \infty)$ and I be a non-empty set. We denote by $l^p(I)$ the Banach space of all functions $f : I \to \mathbb{R}$ with $\|f\|_p := (\sum_{i \in I} |f(i)|^p)^p$. In this work, we investigate the existance of the strictly positive doubly stochastic operators in $l^p(I)$ for finite and infinite I. We prove that there is a doubly stochastic operator in $l^p(I)$ which is strictly positive if and only if I is countable. Also, some properties of such operators are considered.

Keywords: Strictly positive operator, Doubly stochastic operator, Matrix form

Mathematics Subject Classification [2010]: 47A56, 47B60

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Best proximity point of weak contraction

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Abstract. In this article we extend the notion of orthogonal metric space to strongly orthogonal metric space. Also, the aim of this research is to define $\perp$-proximally increasing mapping and obtain several best proximity point results concerning this mapping in the framework of new spaces, which is called strongly orthogonal metric space.

Keywords: Best proximity point, O-set, Strongly orthogonal

Mathematics Subject Classification [2010]: 47H10, 54H25

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Well-posedness of the ZKB equation in the weighted spaces

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Abstract. In this work we consider a generalized dissipative ZK equation. The associated linear part produces both semigroup and group. As the dissipation is directional, we use a regularization method to study the associated initial value problem in Sobolev spaces $H^s(\mathbb{R}^n)$ and some weighted spaces $\mathcal{F}_r^{s,p}$. We also prove an ill-posedness result in the two-dimensional case.

Keywords: Well-posedness, Initial Value Problem, Semigroup

Mathematics Subject Classification [2010]: 35Q35, 35K55, 35Q53

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Embedding theorems on Bergman spaces with admissible weights

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Abstract. Let $\mathcal{H}(\mathbb{D})$ denote the space of analytic functions on the open unit disk $\mathbb{D}$ and ω be a radial weight defined on $\mathbb{D}$. For $0 < p < \infty$, the weighted Bergman space $\mathcal{A}^p_\omega$ consists of functions $f \in \mathcal{H}(\mathbb{D})$ for which

$$\|f\|^p_{\mathcal{A}^p_\omega} = \int_{\mathbb{D}} |f(z)|^p \omega(z) dA(z) < \infty,$$

where $dA(z) = dxdy/\pi$ stands for the normalized area measure in $\mathbb{D}$. We describe those positive Borel measures μ in the unit disc $\mathbb{D}$ such that the Bergman space $\mathcal{A}^p_\omega \subset L^q(\mu)$, $0 < p \leq q < \infty$, where ω belongs to a large class of weights which includes the standard weights and the exponential type weights.

Keywords: Carleson measures, Weighted Bergman spaces, Compact operators

Mathematics Subject Classification [2010]: 47B33, 47B35

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A novel fractional Legendre collocation method for a class of non-linear systems of fractional differential equations

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Abstract. In this paper, an interpolation operator based on the orthogonal fractional Legendre functions is introduced and employed to develop a high-order collocation approach for the numerical solution of a class of non linear systems of fractional differential equations. The applicability and validity of the method are justified by a prototype example.

Keywords: Non-linear system of fractional differential equations, Fractional Legendre functions, Collocation method

Mathematics Subject Classification [2010]: 34A09, 65L05, 65L20

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Some properties of superconvex-cyclic operators

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Abstract. A convex polynomial is a convex combination of the monomials $\{1, z, z^2, ...\}$. A bounded linear operator T on a Banach space X is called superconvex-cyclic if there is a vector $x \in X$ such that $\{\lambda p(T)x |\ \lambda \in \mathbb{C}, p\ is\ a\ convex\ polynomial\}$ is dense in X. Some spectral properties of superconvex-cyclic operators are obtained. It is proved that positive multiples of superconvex-cyclic operators are superconvex-cyclic. It is shown that the convex-cyclicity of an operator T is equivalent to the superconvex-cyclicity of $I_{\mathbb{C}} \oplus T$. Also, we discuss superconvex-cylicity of matrices.

Keywords: Convex polynomial, Convex-cyclic operator, Superconvex-cyclic operator

Mathematics Subject Classification [2010]: 47A16, 46A25

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Lie algebras of generalized Lie groups based on right-invariant vector fields

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Abstract. In this paper, we are going to specify a relation between the Lie algebras of a class of generalized Lie groups and the Lie algebras of a class of Lie groups, by using of the right-invariant vector fields of generalized Lie groups and their one-parameter subgroups.

Keywords: generalized Lie group, Lie algebra, right-invariant vector field

Mathematics Subject Classification [2010]: 22E60, 17B60, 17B66

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Artinian and Noetherian PMV-algebras

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Abstract. In this paper, we introduce the notions of Noetherian and Artinian PMV-algebras and we state an equivalent definition of Noetherian PMV -algebras. We show that if A is a Noetherian (Artinian) PMV -algebra and $I \in Id(A)$, then A/I is a Noetherian (Artinian) PMV -algebra.

Keywords: PMV-Algebra, -Ideal, Noetherian, Artinian

Mathematics Subject Classification [2010]: 03B50, 06D35

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On conjugacy class graph of a Frobenious group of order pq

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Abstract. Let G be the Frobenius group of order pq, where p and q are two distinct primes and $\Gamma(G)$ be the conjugacy class graph of G. In this paper, we show that $\Gamma(G)$ is a disconnected graph with two connected components. Also, we compute the characteristic polynomial, the energy and the Laplacian energy of $\Gamma(G)$.

Keywords: Frobenius group, Conjugacy class graph, Characteristic polynomial, Laplacian energy, Eigenvalue

Mathematics Subject Classification [2010]: 20E45, 05C50, 20D60

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The epiperimetric inequality approach for the regularity of a free boundary problem

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Abstract. We apply the epiperimetric inequality approach and show $C^{1,\beta}$-regularity for the free boundary $\partial\{|u| > 0\}$ at asymptotically flat points of the problem $\Delta u = |u|^{q-1}u + g(x,u)$, where g is Hölder continuous and vanishes faster than $|u|^q$ as $u \to 0$.

Keywords: Epiperimetric inequality, Semilinear elliptic equation, Free boundary, Regulairty

Mathematics Subject Classification [2010]: 35B65, 35J61, 35R35

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Using Helly's theorem and BSE-functions to give a new vector space

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Abstract. Let $(X, |\cdot|)$ be a normed space and X^* be its dual. In this paper we introduce the space $\overline{C}_{\mathrm{BSE}}(X^*)$ consisting of all functions $\sigma : X^* \to \mathbb{C}$ which satisfy in a certain relation like the Bochner-Schoenberg-Eberlein property. Using the Helly theorem, we characterize this space and as an application we give some results on the real line $\mathbb{R}$. Indeed, we give a characterization of (continuous) linear functions on $\mathbb{R}$.

Keywords: Banach algebra, BSE-function, Character space

Mathematics Subject Classification [2010]: 46H05, 46J10

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Acyclic vertex colourings of dense graphs

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Abstract. In this paper, we study acyclic vertex colourings of a dense graph G whose maximum vertex degree grows as a power of n, the number of vertices of G. We are to obtain a proper acyclic vertex colouring of G with the condition that each cycle must have at least $c+1$ distinct colours for some integer constant $c \geq 2$. We use the probabilistic method to establish sufficient conditions on the graph girth and number of edges, under which such a colouring is possible.

Keywords: Acyclic vertex colouring, Dense graphs, Probabilistic method

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Non-equivariant normal form coefficient formulas for cubic $\mathbb{Z}_2$-eqivariant Bogdanov-Taknes singularities

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Abstract. In this paper we deal with non-equivariant normal form coefficient formulas for cubic ($\mathbb{Z}_2$)-equivariant Bogdanov-Takens singularities. Normal form coefficients play a key role for the bifurcation analysis of singular systems while it is a challenging task for non-expert in deriving them. In this conference paper we provide novel results on normal form coefficients of these type of systems.

Keywords: Normal form coefficients, Bifurcation analysis, Bodganov-Takens singularity

Mathematics Subject Classification [2010]: 37L10, 34K18

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On polygroup actions

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Abstract. In this paper we introduce the notion of polygroup action on polygroup from which we are able to build a regular hypergroup and among other results it is proved that actions of polygroups are associated with hyperrepresentations. Hypermatrix representations of multivalued structures were studied by T. Vougiouklis. Representations of polygroups were studied by R. Ameri and et. This study is more general.

Keywords: Polygroup, Action, Hyperrepresentation

Mathematics Subject Classification [2010]: 18F20

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Homological properties of Banach algebras

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Abstract. Let G be a locally compact group, $L^1(G)$ be group algebra and $M(G)$ be measure algebra of G. In this paper, we investigate the homological properties of Banach left module $L^1_\mu(G)$ over algebras $L^1(G)$ and $M(G)$. We show that $L^1_\mu(G)$ is injective Banach left $L^1(G)$–âĹŠmodule if and only if G is discrete and amenable.

Keywords: Locally compact group, Banach module, projectivity, injectivity, flatness

Mathematics Subject Classification [2010]: 43A15, 43A20, 46H25

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Semi-analytical solution of novel coupled partial integral differential equations (PIDEs) with application in Aeroelasticity

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Abstract. One way to derive the governing equations in complex dynamic systems is to use several intermediate coordinate systems. When the systems also include concentrated discrete nodes, can utilize Delta Dirac function in order to apply the properties of nodes in the equations. In this work, a semi-analytical solution of novel coupled partial integral differential equations is developed. The extracted equations include parameter-dependent and time-dependent integral parts which Dirac Delta function is multiplied by itself several times in the parameter-dependent terms. The validation of results for the flutter speed shows that there is a proper precision in the presented semi-analytical solution.

Keywords: Semi-analytical, PIDE, Dirac Delta function, Aeroelasticity

Mathematics Subject Classification [2010]: 74F10, 45K05, 37M15

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Some operator inequalities involving operator monotone functions for sector matrices

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Abstract. Recently, important inequalities for some operator mean inequalities via operator monotone and operator monotone decreasing functions have been proved. In this paper, we extend these inequalities to inequalities for sector matrices which involving the mean of sector matrices, the positive linear maps and operator monotone functions or more precisely, operator monotone increasing (decreasing).

Keywords: Sector matrices, Heinz mean, Heron mean

Mathematics Subject Classification [2010]: 15A60, 15B48, 47A64

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A global optimal solution for the weighted power mean programming problem constrained with fuzzy relational equalities

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Abstract. In this paper, a non-linear programming problem is investigated in which the objective function is defined by the weighted power mean and the feasible region is formed as a special type of fuzzy relational equalities. In this type of fuzzy relational equalities, fuzzy composition is considered as the weighted power mean operator. Some theoretical properties of the feasible region are described. Based on the structural properties of the problem, it is proved that the maximum solution of the feasible region is the unique optimal solution for the problem and finally, an example is presented to illustrate the proposed method.

Keywords: Fuzzy relational equalities, Mean operators, Weighted power mean, Fuzzy compositions

Mathematics Subject Classification [2010]: 06D35, 06B10

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On the complexity function of leading digits of powers of one-digit primes

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Abstract. In this paper we investigate a class of words with low complexity function and accomplish it to the following problem. For a prime number p, consider a sequence of digits $\mathbf{w}_n$, where $\mathbf{w}_n$ is the first digit in the decimal representation of $\mathbf{p}^n$. How to find the number of subwords of $\mathbf{w}_n$ of a given length?

Keywords: Complexity functions, Digital problems, Combinatorics on words, Symbolic dynamics, Sturmian words

Mathematics Subject Classification [2010]: 37B10, 68R15, 11A63

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A nonlinear chattering-free sliding mode control for stabilization of fractional-order complex systems

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Abstract. In this paper, a nonlinear chattering-free sliding mode control method is designed to stabilize uncertain fractional chaotic systems. The main feature of this controller is rapid convergence to the point of equilibrium and minimize chattering and resistance against uncertainties. Moreover, in order to prove the stability of the controlled system based on direct method of Lyapunov theory is used. It is worth noticing that the proposed fractional-order sliding mode controller can be applied to control a broad range of fractional-order dynamical systems.

Keywords: Fractional-order, Sliding mode control, Stabilization

Mathematics Subject Classification [2010]: 26A33, 93D20

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Some results on Ricci-Harmonic Bourguignon solitons and applications

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Abstract. In this paper, we give some results for the almost Ricci-harmonic Bourguignon solitons which is a generalization of Ricci-harmonic solitons.

We also find some integral equations rely on analytic techniques for the compact gradient Ricci-harmonic Bourguignon almost solitons and by this we get rigidity result for a compact gradient Ricci-harmonic Bourguignon almost soliton.

Keywords: Ricci soliton, Gradient Ricci soliton

Mathematics Subject Classification [2010]: 53C25, 53C44

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Minimum-maximum programming with bipolarmax-product fuzzy relation equation constraints

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Abstract. This paper studies the minimum-maximum programming subject to Bipolar Fuzzy Relation Equation (BFRE) constraints with the max-product composition. The characteristics of its feasible domain is expressed. It is shown that there exists an optimal solution for the problem such that each its component is either the corresponding component of the lower or upper bound vector on its nonempty feasible domain. We create a value matrix based on the useful property and apply a modified branch-and-bound method to find the optimal solution of the problem.

Keywords: Bipolar fuzzy relation equation, Min-max programming, Branch-and-bound method

Mathematics Subject Classification [2010]: 90Cxx, 90C70, 90C10

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Asymptotic expansion of the number of derangements in terms of Bell numbers

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Abstract. In this paper we review our study of the difference $D_n - \frac{n!}{e}$, where D_n denotes the number of derangements on n objects. First, we consider some explicit formulas for D_n. Then, using an integral representation for this reference, we compute the moments of this difference, and we also get an asymptotic expansion for D_n with coefficients in terms of the Bell numbers B_n.

Keywords: Derangement, Permutation, Bell number, Integration by parts

Mathematics Subject Classification [2010]: 05A05, 05A16, 11B73

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On Connes-amenability of a class of dual quotient Banach algebras

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Abstract. Let $\mathfrak{A}$ be a Banach algebra with the multiplier algebra $M(\mathfrak{A})$. It is known that, for a closed submodule Z of $\mathfrak{A}^*$, the quotient space $\mathfrak{A}^{**}/Z^{\perp}$ with the product induced by the first Arens product is a dual Banach algebra if and only if $Z \subseteq WAP(\mathfrak{A}^*)$. When $M(\mathfrak{A})$ is a dual Banach algebra, under some conditioins, we show that amenability of $\mathfrak{A}$ is equivalent to Connes-amenability of $\mathfrak{A}^{**}/Z^{\perp}$, where Z is isometrically isomorphic to some predual of $M(\mathfrak{A})$.

Keywords: Amenability, Connes-amenability, Weakly almost periodic functions

Mathematics Subject Classification [2010]: 46H20, 46H25, 47L10

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Reeb flat hypersurface in $\mathbf{Q}^m$

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Abstract. When we was studying on real hypersurfaces in the complex quadric space $\mathbf{Q}^m$, we faced the family of almsot contact manifolds (as Reeb flat real Hopf hypersurfaces in $\mathbf{Q}^m$) that in some sense lies between the family of contact hypersurfaces in one side, and some of the known families of almost contact hypersurfaces such as Sasakian, trans-Sasakian,co-symplectic and (nearly) Kenmutso Hypersurfaces on the other side. in this paper we we describe specific example of this family and review of most important geometric properties of this manifolds.

Keywords: Hypersurface, Complex quadric space, Almost contact structure

Mathematics Subject Classification [2010]: 53C40, 53C55, 53D15

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The Muntz-Galerkin method for numerical solution of the generalized Abel-integral equation

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Abstract. In this work, we propose an efficient numerical method based on the Muntz-Legendre polynomial for solving the generalized Abel-integral equations. This equation is very important in several branches of Physics, engineering and mathematics. A lot of works have been done to study this equation. We show that the presented method is very capable and accurate for solving these kinds of problems. Also, the superiority and effectiveness of the Muntz-Galerkin method will be shown through an example.

Keywords: Generalized Abel-integral equations, Muntz-Legendre polynomial, Muntz-Galerkin method

Mathematics Subject Classification [2010]: 41E10, 49K20, 65R20

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When $q(X)$ is a PF-ring

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Abstract. We examine the situations in which every maximal ideal of the classical ring of quotients $q(X)$ of the ring of real-valued continuous functions on a Tychonoff space X contains a unique minimal prime ideal. In other words, we present some topological and algebraic conditions for which $q(X)$ is a PF-ring.

Keywords: Classical rings of quotients, PF-rings, Rings of continuous functions

Mathematics Subject Classification [2010]: 54C40

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On matrix ring

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Abstract. Let $\mathcal{A}$ be a C^*-algebra, $a \in \mathcal{A}$ and $M_n = M_n(\mathbb{C})$ will denote the C^*-algebra of all complex $n \times n$ matrices, $n = 1, 2, ...$ If we have the map $\varphi : \mathcal{A} \longrightarrow \mathbb{C}$ then for every positive integer n , we can define a map φ_n between matrix $M_n(\mathcal{A})$ and $M_n(\mathbb{C})$ as follow:

$$\varphi_n : M_n(\mathcal{A}) to M_n(\mathbb{C})$$

$$[a_{ij}] \longmapsto [\varphi(a_{ij})]$$

the map $\varphi : R_1 \longrightarrow \mathbb{C}$ is called **completely positive**,if φ_n be positive map for every positive integer n. In this paper, $V_n(a)$, C^*-algebra $n-$dimensional matrix range of a, is defined as all matrices of the form $\varphi(a)$ where φ range over all completely positive linear maps of $C^*(a)$ into M_n which preserve the identity and discuss some properties.

Keywords: Matrix range, C^*- algebras Matrix range, Faithful representation

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A partially described inverse eigenvalue problem for pseudo-symmetric periodic Jacobi matrices

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Abstract. In this paper, pseudo symmetric periodic Jacobi matrices are studied. A partially described inverse eigenvalue problem is solved and some properties of the such matrices are proved. The necessary conditions under which the problem is solvable are given and then a numerical example is given demonstrate efficiency of the method.

Keywords: Inverse eigenvalue problem, leading principal minors, Pseudo-symmetric periodic Jacobi matrix

Mathematics Subject Classification [2010]: 65F18, 05C50

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Vital prime injective S-acts

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Abstract. In this paper, we consider a kind of monomorphism, namely vital monomor- phism and study injectivity with respect to this class of monomorphism, which is denoted by vital prime injective. We investigate some properties of vital injective and study the behaviour of vital prime injective with respect to products, coproducts and direct sum. Keywords: vital rime injectives, vital prime subact, vital monomorphism.

Keywords: Vital rime injectives, Vital prime subact, Vital monomorphism

Mathematics Subject Classification [2010]: 20M30, 20M50, 18A20

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Solving optimization problems with nonconvex feasible sets by using neurodynamic optimization

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Abstract. In this paper, a nonconvex optimization problem which the feasible region is nonconvex set, is considered. A novel neural network model for solving nonconvex optimization problem is proposed. It is proved that the equilibrium points of the neural network model coincides with the alternative optimal solutions of the constrained nonconvex optimization problem. Furthermore, it is shown that under suitable assumptions this model is globally convergent and stable in the sense of Lyapunov at each equilibrium points. Numerical simulation for a nonconvex otimization problem is discussed.

Keywords: Nonconvex optimization, Recurrent neural network, Global optimality conditions, Invex functions

Mathematics Subject Classification [2010]: 90C26, 90C30

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Numerical solution of generalized Gross-Pitaevskii equation by a meshless local method

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Abstract. In this paper, a meshless local radial point interpolation technique is applied for solving 2D generalized Gross-Pitaevskii equation. An efficient fourth-order time differencing Runge-Kutta method is utilized for the time discretization. The main aim of this paper is to show that the meshless local radial point interpolation method is an appropriate technique for solving the non-linear partial differential equations especially generalized Gross-Pitaevskii equation. To show the efficiency of the proposed method, a comparison between this method and Lattice Boltzman and RBF-DQ methods is done.

Keywords: Generalized Gross-Pitaevskii equation, Local radial point interpolation technique, Fourth-order time differencing Runge-Kutta method

Mathematics Subject Classification [2010]: 65M99, 65N99

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On Hankel matrices

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Abstract. A Hankel matrix is a square matrix in which each ascending skew-diagonal from left to right is constant. A matrix R is called integral row stochastic, if each row has exactly a nonzero entry, +1, and other entries are zero. In the present paper, we describe L-ray of a matrix and characterize L-rays of integral row stochastic Hankel matrices. We provide an algorithm for constructing integral row stochastic Hankel matrices.

Keywords: Majorization, Integral row stochastic, Hankel matrices

Mathematics Subject Classification [2010]: 15A36

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Solving free boundary problem by Newton-Raphson method

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Abstract. The mathematical model of biofilm formation leads to discuss a free boundary problem for a system of nonlinear hyperbolic partial differential equations. The differential equations are converted into an equivalent system of Volterra integral equations. In this manuscript we use Newton-Raphson method to solve the nonlinear system of Volterra integral equations (SVIEs) of the second kind. This method converts the nonlinear system of integral equations into a linear integral equation at each step.

Keywords: Newton-Raphson method, Free boundary problem, Nonlinear system of Volterra integral equations

Mathematics Subject Classification [2010]: 65R20, 35Q92, 35E99

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Numerical solution of Poisson equation on bidimentional irregular domains

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Abstract. In this paper a numerical method for solving Poisson equation on bidimensional curvilinear quadrilateral domains is proposed. This method can be generalized to arbitrary closed simply connected domains in R2 with piece-wise smooth boundary. For this purpose a particular transformation is introduced to transform the given quadrilateral domain to computational square domain $D = [-1, 1]^2$. Then Chebyshev pseudo-spectral method is used to solve transformed equation in computational domain. The Chebyshev-Gauss- Lobatto points are chosen in the computation. The performance and validity of this method is illustrated through some numerical examples.

Keywords: Byshev-Gauss-Lobatto (CGL) collocation method, Curvilinear quadrilateral, Quadrilateral, Pseudo-spectral method

Mathematics Subject Classification [2010]: 65N35, 65N22, 65F05, 35J05

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Efficient explicit methods for nonstiff ordinary differential equations

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Abstract. In this paper, we use Albrecht technique to construct a subclass of variable stepsize general linear methods which have large region of absolute stability. Such methods are considered as an alternative to the Nordsieck technique.

Keywords: Initial value problem, General linear methods, Zero-stability, Variable stepsize

Mathematics Subject Classification [2010]: 65L05

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Generalized minimum residual method based on the knowledge of a frame in a Hilbert space

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Abstract. The goal of this paper is to study the application of frames in generalized minimum residual method for solving the operator equation $Lu = f$ where $L : H \to H$ is a bounded, invertible and self-adjoint linear operator on a separable Hilbert space H. Convergence rate in this approach is formed by upper and lower bounds of a frame, so we can control the convergence rate by choosing an appropriate frame with desired values of bounds.

Keywords: Separable Hilbert space, Frame, GMRES method, Operator equation

Mathematics Subject Classification [2010]: 65F10, 65F08

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Non-isolated resolving number of corona product of some families of graphs

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Abstract. Let G be a connected graph and $W = \{w_1, w_2, \ldots, w_k\}$ be an ordered subset of vertices of G. For any vertex v of G, the ordered k-vector

$$r(v|W) = (d(v, w_1), d(v, w_2), \ldots, d(v, w_k)),$$

is called the metric representation of v with respect to W, where $d(x, y)$ is the distance between the vertices x and y. A set W is called a resolving set for G if distinct vertices of G have distinct metric representations with respect to W. A resolving set W is called a non-isolated resolving set for G if the induced subgraph $\langle W \rangle$ of G has no isolated vertices. The minimum cardinality of a non-isolated resolving set for G is called the non-isolated resolving number of G and denoted by $nr(G)$. The aim of this paper is to investigate resolving number of corona product graphs of some families of graphs.

Keywords: Non-isolated resolving sets, Adjacency dimension, Corona product

Mathematics Subject Classification [2010]: 05C12

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Optimality conditions for nonsmooth optimization problems using semi-quasidifferentials

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Abstract. In this paper, semi-quasidifferentiability, as a generalization of well-known quasidifferentiability, is considered to obtain some optimality conditions for a nonsmooth optimization problem. We show that, under some constraint qualifications and a non- degeneracy condition, the KKT-type optimality conditions are achievable. This is done without imposing any locally Lipschitz or continuity or convexity assumption on the objective and constraint functions.

Keywords: Nonsmooth optimization, Semi-quasidifferentiable function, Nonconvex programming

Mathematics Subject Classification [2010]: 49J52, 90C46, 90C30

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Binary corona of asymptotic resemblance spaces

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Abstract. In this paper, we introduce the notion of the binary corona of asymptotic resemblance spaces as a new large scale property of asymptotic resemblance spaces (coarse spaces). In special cases, binary corona can be considered as a generalization of the notion of space of ends of locally compact Hausdorff topological groups.

Keywords: Asymptotic resemblance spaces, Binary corona, Ends of groups, Large scale properties

Mathematics Subject Classification [2010]: 51F99, 53C23, 54C20, 18B30

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Mean ergodic multiplication operators on Hardy spaces

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Abstract. In this paper, the power boundedness and mean ergodicity of multiplication operators are investigated on the Hardy spaces $H^p(\mathbb{D})$, $1 \leq p < \infty$. Let $\mathbb{D}$ be the open unit disk on the complex plane $\mathbb{C}$ and ψ be a function in the space of holomorphic functions $H(\mathbb{D})$. We provide the necessary and sufficient conditions under which a multiplication operator M_ψ is power bounded, mean ergodic and uniformly mean ergodic on the Hardy spaces.

Keywords: Mean ergodicity, Multiplication operator, Hardy space

Mathematics Subject Classification [2010]: 47B38, 46E15, 47A35

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The action of automorphisms of groups on fuzzy subgroups of dihedral groups

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Abstract. In this paper, we determine fuzzy subgroups of dihedral groups in some particular cases by the new equivalence relation which has a consistent group theoretical foundation. In this case, the corresponding equivalence classes of fuzzy subgroups of a group G are closely connected to the automorphism group and the chains of subgroups of G.

Keywords: Equivalence relation, Fuzzy subgroup, Chain of subgroups, Automorphism group, Dihedral group

Mathematics Subject Classification [2010]: 20N25, 20F28

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Some results on Ramsey numbers of K_n-good graphs

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Abstract. Let G and G_1, G_2 be given graphs. By $G \to (G_1, G_2)$ we mean if the edges of G are arbitrarily colored by red and blue, then there is either a red copy of G_1 or a blue copy of G_2 in G. The Ramsey number $R(G_1, G_2)$ is defined as the smallest positive integer n such that $K_n \to (G_1, G_2)$. Also, the star-critical Ramsey number $R_*(G_1, G_2)$ is defined as $min\{\delta(G) : G \subseteq K_r, G \to (G_1, G_2)\}$, where, $r = R(G_1, G_2)$. If G is a connected vertex transitive graph on n vertices and G is a K_m-good graph i.e. $R(G, K_m) = (n-1)(m-1)+1$, then the Ramsey number and the star-critical Ramsey number of K_m versus G^{+e} is determined exactly, where G^{+e} is obtained from G by adding a leaf to G.

Keywords: Star-critical Ramsey number, Complete graph, Transitive graph

Mathematics Subject Classification [2010]: 05C55, 05D10

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A Hermite interpolation method for Duffing equations involving both integral and non-integral forcing terms

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Abstract. In this work, an efficient method is presented for the numerical solution of the nonlinear Duffing equation as an important equation for the mathematical modeling of real-life phenomena. The presented method is based upon the two-point Taylor formula. It is tried to utilize the problem structure in order to extract the needed data for finding the approximate solution. The efficiency and accuracy of the method is demonstrated through the numerical results.

Keywords: Two-point Taylor formula, Duffing equation, Integral and non-integral forcing terms

Mathematics Subject Classification [2010]: 34B15, 34K28, 65D05

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Commutative rings which every module has a prime submodule

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Abstract. In this paper, we study rings in which every nonzero module has a prime submodule. At first, we show that if every nonzero submodule of an R-module M has a prime submodule, then N(R) is a T-nilpotent on M. Finally, we prove every nonzero R-module has at least one prime submodule if and only if R is a Max ring

Keywords: Prime submodule, Maximal submodule, Max ring

Mathematics Subject Classification [2010]: 13A15, 13C60

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Smoothing transformation and a Nystrom method for two-dimensional weakly singular Volterra integral equations

Roghayeh Katani*

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Abstract. Nonlinear weakly singular Volterra integral equations often have non-smooth solutions, particularly at $t = 0$: to overcome this difficulty we propose a smoothing change of variable and then employ Navot's quadrature formula for solving the transformed equation. By using smoothing an equation is obtained which, while still weakly singular, can have a solution as smooth as required. Numerical example shows the efficient of the method.

Keywords: Weakly singular Volterra integral equations, Smoothing transformation, Navot's quadrature

Mathematics Subject Classification [2010]: 65R20, 45G10

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Solutions of Euler equations on the two-dimensional sphere

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Abstract. Two dimensional manifolds are especially important in applications. In particular the sphere is relevant in meteorological applications so in this paper, we use the geometric analysis to explain the Euler equation on the sphere. Also we find exact solutions for incompressible Euler equation on the sphere in some special cases.

Keywords: Incompressible Euler equations, Geometric analysis on manifold, Two dimensional sphere

Mathematics Subject Classification [2010]: 76D05, 53C23

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The upper bound of minimum distance in (r, δ)-local t-LRC codes

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Abstract. In distributed storage system, a code is called locally repairable code (LRC) with availability if the ith coded symbol of an $[n, k]$ linear code C have multiple disjoint sets of code symbols called recovering sets such that it can be recovered from them. The size of recovering set is called locality. In this paper we study the LRCs to the (r, δ)-locality case ($\delta > 2$) of multiple node failures. Such codes ensure could be repaired more quickly and this procedure is useful in reducing repair cost.

Keywords: Locally repairable code, Erasure codes, Availability, Recovery graph

Mathematics Subject Classification [2010]: 94A24, 94A29, 94B35

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Liouville-type theorems for p-harmonic maps with potential

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Abstract. In the present paper, $p-$harmonic maps with potential from a complete Riemannian manifold of non-negative Ricci curvature to a complete Riemannian manifold are studied. First, we compute the first and second variational formulas for this kind of harmonic maps. Then, a Liouville-type theorem for p-harmonic maps with potential is given

Keywords: $p-$ harmonic maps, Liouville theorems, Calculus of variations

Mathematics Subject Classification [2010]: 53C43, 58E20

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A study of locally convex manifolds in the realm of geometric control theory

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Abstract. Following the unified approach of Kriegl and Michor (1997) for a treatment of global analysis on the convenient locally convex spaces, we give a generalization of Rashevsky-Chow's theorem for control systems in regular connected manifolds modelled on convenient locally convex spaces which are not necessarily normable. To indicate an application of our approach to the infinite-dimensional geometric control problems, we conclude the main presentation with a novel controllability result on the group of orientation-preserving diffeomorphisms of the unit circle, which has applications in, e.g., conformal field theory as well as string theory and statistical mechanics

Keywords: Controllability, Infinite-dimensional manifolds, Geometric control, Convenient locally convex spaces

Mathematics Subject Classification [2010]: 93B05, 93B27

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On matching energy of graphs

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Abstract. The matching energy of a graph G, denoted by $ME(G)$, is defined as the sum of absolute values of the zeros of the matching polynomial of G. In this paper, we would like to present some lower bounds for $ME(G)$. For any connected graph G, it is proved that $ME(G) \geq 2\mu(G)$, where $\mu(G)$ is the matching number of G. Also it is shown that if G has no perfect matching, then $ME(G) \geq 2\mu(G) + 1$, except for $K_{1,2}$. Moreover, we characterize some class of graphs whose matching energy is at least equal to the number of vertices.

Keywords: Matching energy, Matching polynomial, Matching number

Mathematics Subject Classification [2010]: 05C31, 05C70

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The discrete variant of a kind of continuous problem

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Abstract. In this paper, we present the following fractional discrete boundary-value problem

$$\begin{cases} -\Delta\left(\frac{1}{2}{}_0\Delta_k^{-\beta}(\Delta u(k)) + \frac{1}{2}{}_k\Delta_T^{-\beta}(\Delta u(k))\right) = \lambda f(k, u(k)), \quad k \in [1,T]_{\mathbb{N}_0}, \\ u(0) = u(T+1) = 0, \end{cases}$$

where $T \geq 2$ is a fixed positive integer, $0 \leq \beta < 1$ and ${}_0\Delta_k^{-\beta}$ and ${}_k\Delta_T^{-\beta}$ are the β-th left and right discrete fractional sum, respectively, and $\Delta u(k) = u(k+1) - u(k)$ is the forward and $[1,T]_{\mathbb{N}_0}$ is the discrete set $\{1, 2, \cdots, T-1, T\}$ and $\mathbb{N}_0 = \{0, 1, 2, \cdots\}$, difference operator $f : [1,T]_{\mathbb{N}_0} \times \mathbb{R} \to \mathbb{R}$ is a continuous function, $\lambda > 0$ is a parameter.

Keywords: Discrete fractional calculus, Discrete nonlinear boundary value problem, Continuous nonlinear boundary value problem

Mathematics Subject Classification [2010]: 26A33, 39A10, 34B15

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Some new results for residual Fisher information distance

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Abstract. Fisher information plays a pivotal role throughout statistical inference especially in optimal and large sample studies in estimation theory. It also plays a key role in physics, thermodynamic, information theory and other applications. In this paper, we establish some new results on residual Fisher information distance (RFID) between residual density functions of two systems. Further, some results on RFID and their relations to other reliability measures are investigated along with some comparison of systems based on stochastic ordering. A lower bound for RFID measure is provided based on quadratic form of hazards functions. In addition, RFID measure for equilibrium distributions are studied.

Keywords: Equilibrium distribution, Escort distribution, Fisher information distance, Residual density function, Stochastic ordering

Mathematics Subject Classification [2010]: 18A32, 18F20, 05C65

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A mixed type functional equation in p-Banach spaces

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Abstract. In this paper, we consider and solve a mixed type functional equation in connection with a characterization of inner product spaces. This is applied to give a solution to the stability problem for the quadratic functional equation in the class of mappings from a quasi-normed space into a p-Banach space.

Keywords: p-Banach space, Quasi-norm, Mixed type functional equation

Mathematics Subject Classification [2010]: 46B20, 39B52, 46A16

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On non-linear maps preserving Drazin invertible operator matrices

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Abstract. Let $\mathcal{H}$ be a complex Hilbert space and $\Psi : \mathcal{B}(\mathcal{H}) \to \mathcal{B}(\mathcal{H})$ be a bijection, not necessarily linear and unital. We give the general form of Ψ under some preserving conditions on operator matrices in $\mathcal{B}(\mathcal{H}^2)$ related to the square zero or Drazin invertible (of index at most 1) generalized Schur complements.

Keywords: Preserver problem, Drazin invertible operator, Schur complement, Square zero operator

Mathematics Subject Classification [2010]: 47A08, 15A99, 47B49

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Penalty ADM algorithm for mean-Conditional Value-at-Risk portfolio optimization problem

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Abstract. In this paper, we consider the mean-Conditional Value-at-Risk portfolio optimization problem including short-selling and cardinality constraints. The penalty alternating direction method is used to solve the mixed-integer linear model. Experi- ments are conducted to show the efficiency of the proposed method using the data set of the S&P index for 2018.

Keywords: Portfolio optimization, Mean-CVaR, Penalty alternating direction method

Mathematics Subject Classification [2010]: 90C11, 90C90

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Precover of S-posets over pomonoids

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Abstract. In this paper we introduce the concept of an X-precover for a class of S- posets X. Then we prove that for those classes that are closed under isomorphisms and directed colimits, directed colimits of precovers are precovers. We also provide the necessary and coefficient conditions for S-posets to have X-precovers. Finally, we show that every S-poset has a projective precover.

Keywords: S-posets, Pomonoids, Precover, Cover, Projective

Mathematics Subject Classification [2010]: 20M30, 06F05

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On subsemicovering and the fundamental inverse category of a topological space X

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Abstract. Brazas extended the concept of covering map by the phrase "A semicovering map is a local homeomorphism with continuous lifting of paths and homotopies." In this lecture, via reviewing the concept of subcovering, semicovering map and subsemicovering map, we obtain some relation between subsemicovering and the fundamental inverse monoid of a topological space X.

Keywords: Subcovering, Semicovering maps, Subsemicovering map, Covering map

Mathematics Subject Classification [2010]: 57M10, 57M12, 57M05

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Some properties of nonlinear singular Volterra integral equations with vanishing delay

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Abstract. In this paper, we consider blow up and quenching behavior of singular Volterra integral equations with vanishing delay. The blow up behavior of the derivative is quenching. Quenching occurs only when solutions approach the singularity point in finite time. But this is not sufficient for the blow-up of the first derivative at that time.

Keywords: Nonlinear Volterra integral equations, Blow up, Quenching

Mathematics Subject Classification [2010]: 45G05

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Justification of the two-dimensional equations of shells with von Karman boundary conditions

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Abstract. In this work, using the method of asymptotic expansions with the thickness as the "small" parameter, we show that the three-dimensional for a nonlinearly elastic shells of Saint Venant-Kirchhoff material with boundary conditions of von Karman's type, written in curvilinear coordinates reduces to two-dimensional von Karman model.

Keywords: Nonlinear elasticity, Shell theory, Von Karman conditions, Asymptotic analysis.

Mathematics Subject Classification [2010]: 74B20, 74K25, 74G10

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On set-valued F-contraction mappings and Volterra-type integral equations

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Abstract. In this paper, we present some new fixed point theorems involving set-valued contractions in the setting of quasi-ordered metric spaces. We generalize Banach contraction principle in a different way than in the known results from the literature. Some examples and an application to the existence of solution of Volterra-type integral equations are given to support the obtained results. In particular, we refer to the results of Wardowski [Fixed points of a new type of contractive mappings in complete metric spaces, Fixed Point Theory and Appl. 2012, 2012:94].

Keywords: Fixed point, Quasi-ordered complete metric spaces, F-contraction Maps, Order-closed, Approximative values

Mathematics Subject Classification [2010]: 47H10, 47S50

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Depth of a pair of ideals on ZD-modules

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Abstract. Let R be a Noetherian ring, I and J be two ideals of R, and S be a Serre sub- category of the category of R-modules satisfying the condition C_I . We extend the notion of $S-$depth of I on a finitely generated R-module M, denoted by $S-\text{depth}(I, M)$, to the class of ZD-modules. Next, as a generalization of $S-\text{depth}(I, M)$ and $\text{depth}(I, J, M)$, the $S-$depth of (I, J) on a ZD-module M is defined as $S-\text{depth}(I, J, M) = \inf\{S-\text{ depth}(a, M) : a \in \tilde{W}(I, J)\}$, and some properties of this concept are investigated. Also, the relations between $S-\text{depth}(I, J, M)$ and $H^i_{I,J}(M)$ are studied.

Keywords: Depth, Local cohomology, Serre subcategory, ZD-Module

Mathematics Subject Classification [2010]: 13C15, 13C60, 13D45

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Cartan-Brauer-Hua type conditions over the division rings with involution

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Abstract. Cartan-Brauer-Hua Theorem is a well-known theorem which states that if R is a subdivision ring of a division ring D which is invariant under all elements of D or $DRD^{-1} \subseteq R$ for all $d \in D\backslash\{0\}$, then either $R = D$ or R is contained in the center of D. The invariance idea of this basic theorem is the main notion of this paper. We prove that if D is a division ring with involution * and M is a subspace of D which is invariant under all symmetric elements of D, then either M is contained in the center of D or is a Lie ideal of D.

Keywords: Division ring, Lie ideal, Involution

Mathematics Subject Classification [2010]: 16K40, 16W10

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Find the extreme points of the nonlinear algebraic equation based on the improved bisection method and the Monte Carlo method

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Abstract. Obtaining Extreme points of Nonlinear Algebraic Equation is widely used in various sciences in optimization. Derivatives are often used to find extreme points. When the function is complex or not derivable, meta-heuristic algorithms can be used to find the extreme points of Nonlinear Algebraic Equation. In this paper, we first modify the bisection method in line with the intended purpose, and then present a new method using the integration of the new bisection method and the Monte Carlo method to find the extreme points of the functions. The advantage of this method is its use in complex functions. It is indivisible.

Keywords: Extreme points, Nonlinear Algebraic Equation, Monte Carlo, Bisection method, R Software

Mathematics Subject Classification [2010]: 11K45, 11H55, 13P25

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Characterization of Some quasisimple and almost simple groups by their character degrees

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Abstract. Let G be a finite group and $cd(G)$ denote the set of complex irreducible character degrees of G. Let G be a sporadic quasisimle group or an almost simple group with socle $PSp_4(q)$ or $PSL_4(q)$. The main result of this paper is to characterize G by $cd(G)$.

Keywords: Character degrees, Sporadic quasisimple groups, Projective conformal symplectic groups, Projective general linear groups, Huppert's conjecture

Mathematics Subject Classification [2010]: 20C15, 20C33, 20G40

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A local Multiquadric quasi-interpolation operator based on the piecewise linear hat functions

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Abstract. In this paper, we introduce a local quasi-interpolation operator by generalization of the hat functions to Multiquadrics. It possesses linear reproducing property and preserves positivity and monotonicity. It is an improvement of the piecewise linear interpolation in the sense that it is in C^{∞}. The local property of the proposed operator offers an advantage in terms of computational complexity rather than the global Multiquadric (MQ) quasi-interpolation formula. We also prove that the proposed scheme converges with a rate of $O(h^2)$. Numerical results give an accurate reconstruction of the original function in the well-known Runge phenomenon.

Keywords: Quasi-interpolation, Multiquardic RBF, Piecewise linear hat functions

Mathematics Subject Classification [2010]: 65D05, 65D15, 65D20

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Collocation method for linear and nonlinear Volterra integro-differential equations

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Abstract. A numerical method based on quintic B-spline is developed to solve the linear and nonlinear Volterra integro-differential equations up to order 4. The solution and its derivatives are collocated by quintic B-spline and then the integral equation is approximated by Gauss-Kronrod-Legendre quadrature formula of degree 2. The error analysis of proposed numerical method is studied theoretically. Numerical results are given to illustrate the efficiency of the proposed method which shows that our method can be applied for large values of N. The results are compared with those obtained by other methods which show that our method is accurate.

Keywords: Linear and nonlinear Volterra integro-differential equations, Quintic B-spline, Gauss-Kronrod-Legendre quadrature formula

Mathematics Subject Classification [2010]: 34K05, 34K30, 41A15

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Bisurcation structure in one dimensional linear-hyperbolic maps

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Abstract. We consider an invertible linear-hyperbolic map proposed by Nordmark, investigating the structure of smooth and nonsmooth bifurcations occuring in this system. The presence of the vertical and horizontal asymptotes in the hyperbolic function causes several nonstandard bifurcation structures. Also we show that depend on the exponent of the hyperbolic branch, the boundaries of a periodicity region are related either to subcritical, or supercritical, or degenerate flip bifurcations of the related cycle.

Keywords: Piecewise smooth map, Border collision bifurcation, Invertible map

Mathematics Subject Classification [2010]: 37B40, 37D45

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Adjoint of certain weighted composition operators on certain weighted Hardy Spaces

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Abstract. Let υ be an analytic function on the unit disk D, and ϕ be a holomorphic self-map of D. The weighted composition operator with symbols ϕ and υ is defined by $C_{\upsilon,\phi} = \upsilon f o \phi$. In this paper, we characterize the adjoint of certain weighted composition operators on certain weighted Hardy spaces.

Keywords: Dirichlet space, Weighed composition operator, Adjoint, Bergman space, Weighted Hardy space

Mathematics Subject Classification [2010]: 47B33, 47B38

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Some classes of continuous maps in terms of closure and interior operators

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Abstract. In this paper, we give some generalized and modification categories of topological spaces by monotone operators and investigate some categorical properties of them. In particular, we study the properties of some classes of morphisms, such as final, initial, closed and open morphisms in these categories.

Keywords: Generalized topology, Monotone operator, Closure and interior operator

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Primary decomposition of submodules of a free module of finite rank over a domain

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Abstract. Let R be a commutative ring with identity.In this paper, we study the existence of primary decomposition of a submodule of F over a domain and characterize the minimal primary decomposition of this submodule.

Keywords: Primary decompositions, Free modules, GCD domains, Bezout domains

Mathematics Subject Classification [2010]: 13C10, 13C99, 13G99

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Stability theory and representations

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Abstract. Many model theoretic aspects of the dynamical representations of the action of the groups (in particular $\mathbb{Z}$) on the spaces of types or models were investigated in a few works such as the one from the present paper's author. In this paper, we deal with higher order and more complex actions raised from more general groups (such as both automorphism and definable groups) acting on the structures or spaces of types. We will consider the class of NIP theories (which is is amongst the most important classes of first order theories studied in model theory) from the point of view of the defined representations.

Keywords: Model theory, stability theory, Representations of dynamics of group actions, NIP

Mathematics Subject Classification [2010]: 34C14, 53C44

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Nonparametric regression modeling of shape data using ordinary procrustes analysis

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Abstract. From a topological viewpoint, shape data are points on a particular manifold and so to construct a longitudinal model for treating shape variation is not as trivial as thought. Unlike using the common parametric models to do such a task, we invoke Procrustes analysis in the context of a nonparametric framework. After conveying the problem into the nonparametric regression model, we utilize the weighted least squares method to estimates the related parameters. Our proposed model shows its superiority while compared with other counterpart models.

Keywords: Nonparametric inference, Kernel regression, Longitudinal model, Procrustes analysis, Shape analysis

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z_c°-ideals in $C_c(X)$ VS z°-ideals in $C(X)$

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Abstract. $C_c(X)$ is a z_c°-ideal. Also, If X is a CP-space, then every ideal in $C_c(X)$ is a z_c°-ideal. Every z_c°-ideal is a z_c-ideal but the converse is not necessarily true. We prove that every z_c°-ideal is a contraction of a z°-ideal. Furthermore,if X is a strongly zero-dimensional space, then every z_c°-ideal is a contraction of a unique z°-ideal. Moreover, in the class of almost CP-spaces, X is strongly zero-dimensional space if and only if every z_c°-ideal is a contraction of a unique z°-ideal.

Keywords: Zero-dimensional space, Strongly zero-dimensional space, $z_c^\circ-$ideals

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Some of skew cyclic codes of length p^s over $\mathbb{F}_p^m + u\mathbb{F}_p^m$

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Abstract. In this paper, we characterize the structure of some special skew cyclic codes of length p^s over chain ring $\mathbb{F}_p^m + u\mathbb{F}_p^m$, where $u^2 = 0$ and p is a prime number. we require to construct some new techniques for skew polynomials ring. Also, we determine size of these codes.

Keywords: Skew cyclic code, Chain ring

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Applying the attention mechanism on deep Galerkin method for option pricing problems

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Abstract. Partial differential equations have many limitations as well as high performance in high dimensions. In this paper, we first use machine learning algorithms to transfer the high-dimensional challenge in partial differential equations to the machine learning challenge. Here, we employ the neural network architecture similar to the architecture for long-short term memory (LSTM) networks and highway networks. Finally, since the attention mechanism is one of the techniques that can be used to improve accuracy and specially speed, we apply it to improve the method.

Keywords: Deep Galerkin Method, Neural Networks, Attention Mechanism, LSTM Networks, Vanilla Options

Mathematics Subject Classification [2010]: 65M99, 91G20, 91G80

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Some combinatorial properties of the derivative operator

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Abstract. Studying expressions of the form $(f(x)D)^p$, where $D = \frac{d}{dx}$ is the derivation operator, goes back to Scherk's Ph.D. thesis in 1823. Some new problems in quantum physics motivated physicists to publish many papers in this area based on combinatorial methods. This has led some mathematicians and computer scientists to continue such studies. In this manuscript, we discuss about expansion of $(f(x)D)^p$ and related coefficients. Particularly we discuss about the values and the combinatorial meaning and the values of these coefficients.

Keywords: Derivative operator, Expansion, Increasing trees

Mathematics Subject Classification [2010]: 05B20, 05E30

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b-Birkhoff orthogonal elements in 2-normed linear spaces

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Abstract. In this paper, we define the notion of a bilinear 2-operator on the cartesian product of two subspaces of a 2-normed spaces and obtain some Corollary about it. Also, we discuss the relationships between 2-functionals and the existence of b-Birkhoff orthogonal elements in 2-normed linear spaces. Moreover, we obtain some characterizations of 2-inner product spaces by b-Birkhoff orthogonality.

Keywords: b-Birkhoff orthogonal, 2-functionals, 2-hyperplane, 2-inner product, 2-normed

Mathematics Subject Classification [2010]: 46C05

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Numerical solution of Fredholm integral equations by using non-uniform Haar wavelets

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Abstract. A novel approach to the precise numerical solution of the Fredholm integral equations using non-uniform Haar wavelets is provided in this paper. This approach is based on the truncated expansion of the non-uniform Haar functions used to transform the Fredholm integral equation into algebraic equations system which can be effectively solved with suitable solvers. Finally, a numerical example is given for the efficiency of the proposed method. accurate.

Keywords: Non-uniform Haar wavelet, Operational matrix of integration, Approximate solution, Fredholm integral equation

Mathematics Subject Classification [2010]: 45B05, 65T60, 65Gxx, 65R20

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An alternative perspective on FC-pure injectivity of modules

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Abstract. Given modules M and A, M is called A-FC-pure-subinjective if for every FC-pure extension B of A, each homomorphism from A to M can be extended to a homomorphism from B to M. The FC-pure-subinjectivity domain of M is defined to be the collection of all modules A such that M is A-FC-pure-subinjective. Basic properties of FC-pure-subinjectivity domains are investigated. In particular, we obtain characterizations for various types of rings and modules, including f-injective modules, von Neumann regular rings, Kothe rings, semisimple rings, and right Noetherian rings in terms of FC-pure-subinjectivity domains.

Keywords: FC-pure injective module, FC-pure-subinjectivity domain, Kothe ring

Mathematics Subject Classification [2010]: 16D80, 16D10, 16D50

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Composition operators on weighted variable exponent Bergman spaces

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Abstract. Let $\mathbb{D}$ be the open unit disk in the complex plane $\mathbb{C}$, and let φ be a holomorphic function from disk $\mathbb{D}^m$ into $\mathbb{D}^n$. We study the composition operator C_φ on the weighted variable exponent Bergman space with classical radial weight and give a sufficient condition for the boundedness of this operator on $A^{p(\cdot)}_\alpha(\mathbb{D}^n)$.

Keywords: Composition operator, Bergman space, Weighted variable exponent Lebesgue space, Polydisk

Mathematics Subject Classification [2010]: 47B33, 30H20, 46B50

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Coefficient estimates for a new subclass of meromorphic bi-univalent functions by using Faber polynomial

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Abstract. In this paper, we find the coefficient bounds for meromorphic bi-univalent functions of subclass $\mathcal{N}_{\Sigma_{\mathfrak{B}}}(\lambda, \beta, \alpha)$ by using the Faber polynomial expansions which will be defined on the domain $\Delta = \{z \in \mathbb{C} : 1 < |z| < \infty\}$. The results presented in this paper would generalize and improve some works of earlier authors.

Keywords: Analytic functions, Univalent and bi-univalent functions, Meromorphic bi-univalent functions, Coefficient estimates, Faber polynomial

Mathematics Subject Classification [2010]: 30C45, 30C50

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Automatic continuity of bijective jointly linear separating maps between banach modules

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Abstract. Let A and B be Banach algebras. Linear maps $T, S : A \to B$ are called *jointly separating* whenever $a \cdot b = 0$ implies $Ta \cdot Sb = 0$, for all $a, b \in A$. In this paper, first we generalize the definition of jointly linear separating maps to Banach module cases. Then we give the characterization of such maps. Finally, we prove that under certain conditions on Banach modules, both jointly separating maps are continuous if at least one of them is bijective.

Keywords: Banach module, Separating, Hyper maximal, Jointly separating

Mathematics Subject Classification [2010]: 46H25, 46H40, 47B37

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Some results on the open locating-total domination number in graphs

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Abstract. In this paper, we introduce a concept as open locating-total dominating set (OLTD-set) in graphs. $S \subseteq V(G)$ is an OLTD-set if and only if S is a total dominating set of G and for any pair of distinct vertices x and y in $V(G)$, we have $N(x) \cap S \neq N(y) \cap S$. So, the open locating-total domination number $\gamma_t^{OL}(G)$ is the minimum cardinality of an OLTD-set for G. In this paper, we determine the open locating-total dominating set of some families of graphs. Also, the open locating-total domination number is calculated for two families of trees.

Keywords: Open neighborhood locating domination, Total dominating set

Mathematics Subject Classification [2010]: 05C69

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Lattices of radical subacts of acts over semigroups

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Abstract. Our objective in this paper is to give some properties of radical subacts and prime subacts of any act over a semigroup S. We prove that the radical subacts of an $S-$act form an $S-$lattice. We also determine the relationship between $S-$lattice of radical subacts and the set of prime subacts of an $S-$act.

Keywords: $S-$act, Prime subact, Radical subact

Mathematics Subject Classification [2010]: 20M30, 20M50

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Two stage shrinkage pretest procedure under a reflected gamma loss function

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Abstract. In this paper, we consider the problem of two stage shrinkage pretest (TSP) estimation for the scale parameter σ of a Rayleigh distribution under the reflected gamma loss (RGL) function. We define a TSP estimator using a prior point information σ_0 and compare its risk with the pooled estimator of σ under the RGL function numerically and graphically. The usefulness of this estimator with respect to the pooled estimator in the presence of σ_0 under different cases is discussed.

Keywords: Rayleigh distribution, Reflected gamma loss function, Two stage estimation

Mathematics Subject Classification [2010]: 62F15

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Engel orthomodular lattices

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Abstract. In this paper, the concepts of solvable and engel ortomodular lattices are defined and their properties are investigated. The notion of n-Engel ortomodular lattices as a natural generalization of distributive ortomodular lattices is introduced, and we discuss Engel orto modular lattices, which is defined by left and right normed commutators.

Keywords: Engel ortomodular lattices, Commutator, Solvable, Engel element

Mathematics Subject Classification [2010]: 06D35, 03G12, 03B50

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Application of confluent hypergeometric distribution series to univalent functions defined by the means of convolution structure

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Abstract. In the present paper, we introduce a new subclass of univalent functions associated with confluent hypergeometric distribution. We obtain main results of this subclass related with sharp coefficient estimate and convolution preserving properties. Also we study neighborhood structure and convexity of our subclass. Furthermore by applying the convolution (Hadamard product) some geometric properties are obtained.

Keywords: Univalent function, Convolution, Confluent hypergeometric function, Convex set, Coefficient bound

Mathematics Subject Classification [2010]: 30C45, 30C50

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Factorization properties of quotients of polynomial rings by monomial ideals

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Abstract. Suppose that K is a field, $S = K[x_1, \ldots, x_n]$ and I is a monomial ideal of S. We study factorization properties of the ring $R = S/I$. In particular, we present conditions equivalent to R being présimplifiable or a bounded factorization ring or a finite factorization ring or a unique factorization ring. We also present necessary conditions and sufficient conditions for R to be a half-factorial ring.

Keywords: Unique factorization ring, Bounded factorization ring, Finite Factorization ring, présimplifiable ring, Monomial ideal

Mathematics Subject Classification [2010]: 13F15, 13A05, 13F55

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Some fixed point theorems in normed groups

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Abstract. Fixed point theory for non-expansive and related mappings plays a significant role in the development of the functional analysis and its applications. On the other hand,group-norms have also played a role in the theory of topological groups. Some results on the existence and uniqueness of fixed points on normed groups and Banach group are proved in this paper.

Keywords: Banach group, Fixed point, Normed group

Mathematics Subject Classification [2010]: 47H10,22A10,46J10

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Injectivity of rings of measurable functions

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Abstract. In this note it is shown that whenever $\mathcal{A}$ is a field of subsets of an arbitrary set X, the ring of real-valued $\mathcal{A}$-measurable functions, denoted by $\mathcal{M}(X,\mathcal{A})$, is self-injective if and only if $\mathcal{A}$ is a complete and $\mathfrak{c}^+$- additive field of sets. The ring of locally constant continuous functions is a useful tool for achieving to this purpose. We also determine the $\aleph_0$-self-injectivity of rings of locally constant continuous functions. We observe that the rings of locally constant real-valued continuous functions is very suitable for examining some algebraic problems of rings of measurable functions. Indeed every ring of real valued $\mathcal{A}$-measurable functions is an essential subring of a ring of locally constant real-valued continuous functions.

Keywords: Self-injectivity, $\aleph_0$-self-injectivity, Rings of measurable functions, Zero-dimensional spaces

Mathematics Subject Classification [2010]: 54C40

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Controlled g-frames and their operators

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Abstract. Controlled frames for spherical wavelets were introduced in to get a numerically more efficient approximation algorithm. In this paper by extending the concept of controlled frames and g-frames, the concept of controlled g-frames is defined and an appropriate representation space to organize the synthesis and analysis operators is constructed. Finally the basic properties of these operators and their composition like being bounded, surjective and being trace class of the operator $T_\Lambda T_\Theta^*$ is discussed.

Keywords: g-frames, Controlled frames, Trace class operator

Mathematics Subject Classification [2010]: 42C15, 42C40, 41A58

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A comparative study of metaheuristic algorithms as an application of Bio inspired optimization

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Abstract. In this paper, we propose by means of three well known Metaheuristic Algorithms (MAs) that are Flower Pollination Algorithm (FPA), Bat Algorithm (BA), and Artificial Bee Colony Algorithm (ABCA) a solution of an Initial Value Problems (IVPs) used to population modeling in the ecological fieeld that are the exponential and logistic growth models. By a given example, the conducted comparison between these MAs performances in terms of solution quality shows that FPA yields satisfactorily precise approximation of the solution.

Keywords: Flower Pollination Algorithm (FPA), Bat Algorithm (BA), Artificial Bee Colony Algorithm (ABCA), Initial Value Problem (IVP), Metaheuristics

Mathematics Subject Classification [2010]: 65D30, 65K05

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The persistence property for submodules of a Dedekind module

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Abstract. Let R be an integral domain and M be a faithful multiplication Dedekind R-module. We proved that every proper submodule of M has the persistence property and for non-zero proper ideals $I_1, \cdots, I_n$ of R, $Ass^{\infty}(I_1^{k_1} \cdots I_n^{k_n} M) = \bigcup_{i=1}^{n} Ass^{\infty}(I_i M)$, where $k_1, \cdots, k_n \geq 1$. We also show that every non-zero submodule of M is Ratlif-Rush closed.

Keywords: Dedekind modules, Faithful modules, Multiplication modules, Persistence property, Ratlif-Rush closed

Mathematics Subject Classification [2010]: 13F05, 13C13, 13C99

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Numerical solutions of a mathematical model for the spread of computer virus using an artificial neural networks

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Abstract. Computer virus is a harmful computer program that enters the victim computer without authorization. In this work, we intend to consider an epidemiological model of computer virus. The model consists of three nonlinear first order ordinary differential equations. We solve the model with the aid of the theory of universal approximation capability of artificial neural networks. To do this, we propose a three layer feedforward neural networks to approximate the system of nonlinear ordinary differential equations. The numerical solutions are presented in order to show the efficiency and accuracy of the proposed method.

Keywords: Computer virus, Modified epidemiological model, System of ordinary differential equations, Numerical solutions, Artificial neural networks

Mathematics Subject Classification [2010]: 34Fxx, 68Uxx, 68Wxx

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Global existence and uniform stability for a system of wave equations of Kirchhoff type with degenerate damping effects and nonlinear sources

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Abstract. In this article we are concerned with asymptotic stability and lower bounds of blow up solutions for a class of coupled wave equations of Kirchhoff type with degenerate damping effects and nonlinear sources. Under appropriate assumptions on initial datum we show existence of global solutions and obtain an energy decay estimate by employing a lemma of Komornik [1].

Keywords: Kirchhoff equation, Stability, Instability

Mathematics Subject Classification [2010]: 35B40, 35L20, 35B35

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On invariant submanifolds of generalized quasi Sasakian manifolds

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Abstract. In this paper, we prove that every invariant submanifold of a generalized quasi Sasakian manifold is again a generalized quasi Sasakian manifold and give some characterization results for the second fundamental form h and the shape operator A. Finally, we show that invariant submanifolds of a G.Q.S manifold are minimal.

Keywords: Generalized quasi Sasakian manifolds, Invariant submanifolds, Minimal submanifolds

Mathematics Subject Classification [2010]: 53C25, 53C40

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On the number of solutions of commutator equation $[x, y] = g$ in a finite group of nilpotency class two

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Abstract. In this paper, we consider the finitely presented groups H_m as follows:

$$H_m =< a, b | a^{m^2} = b^m = 1, b^{-1}ab = a^{1+m} >, m \geq 2.$$

For $g \in G$, we consider $\rho_g(G) = (x, y) \mid x, y \in G, [x, y] = g$. Then the probability that the commutator equation $[x, y] = g$ has solution in a finite group G, written $P_g(G)$, is equal to $\frac{|\rho_g(G)|}{|G|^2}$. By using the numerical solutions of the equation $xy - zu \equiv t(mod \quad n)$, we derive formulas for calculating the probability of $\rho_g(G)$ where $G' \leq Z(G)$.

Keywords: Finite groups, Nilpotent groups, Commutativity degree, GAP

Mathematics Subject Classification [2010]: 20F12, 20D15

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New methods to accelerate the frame algorithm

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Abstract. The frame algorithm is one way for approximating the function f in a Hilbert space based on the knowledge of some frame bounds. In this paper we design two algorithms in order to improve the acceleration of the frame algorithm. These algorithms have a faster convergence rate than the classical frame algorithm.

Keywords: Frame, Frame algorithm, Chebyshev polynomials

Mathematics Subject Classification [2010]: 65F10, 65F05

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A relationship between algebraic graph theory and associated prime ideals

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Abstract. In this paper, we de
ne the torsion graph determined by equivalence classes of torsion elements, denoted by $A_E(M)$. We shall prove that for every torsion
finitely generated module M over a Dedekind domain R, a vertex of $A_E(M)$ has degree two if and only if it is an associated prime of M.

Keywords: Associated prime ideals, Dedekind domain, Zero-divisor graph, Chromatic number, Clique number

Mathematics Subject Classification [2010]: 13F05, 16D10, 05C15, 05C69

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On the random bony attractors

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Abstract. An open set of skew products over the Bernoulli shift with fiber [0, 1] is constructed such that maximal attractors of these skew products are either a continuous invariant graph or a bony attractor. Moreover, maximal attractors carry an invariant ergodic measure that projects to the Bernoulli measure in the base. These skew products have negative fiber Lyapunov exponents and their fiber maps are non-uniformly contracting, hence the non-uniform contraction rate are measured by Lyapnnov exponents.

Keywords: Skew product, Invariant graph, Maximal attractor, Bony attractor

Mathematics Subject Classification [2010]: 37C70, 37C40, 37H15, 37A25

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A local meshless technique for simulating 3-D Brusselator system by CPM

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Abstract. The Brusselator system represents an interesting model to describe reaction-diffusion dynamics. This work proposes a hybrid advanced numerical method to solve the variable diffusion coefficients Brusselator system on the surface using an effective local meshless technique based on the closest point method (CPM). The proposed local meshless procedure provides the sparse coefficient matrix, which reduces the computational cost and time. Also, as an efficient technique in numerical methods to solve the partial differential equations (PDEs) on the surface, CPM is used to deal with surface operators.

Keywords: Reaction-diffusion Brusselator system, Local meshless technique, Closest point method, Surface operators, Radial basis function

Mathematics Subject Classification [2010]: 35K99, 34M99

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Frame-type expansion of functions and modulation spaces

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Abstract. In this paper we introduce a great class of wavelet systems and their duals (based on MRA) which generally are not frames in $L^2(R^d)$ Then we propose Frame-type expansions that could happen in different senses of series convergence. As a new point of view, these expansions are considered in modulation spaces which is our novelty.

Keywords: Frames, Dual wavelets, Modulation spaces, Frame-type wavelets

Mathematics Subject Classification [2010]: 46C20, 42C15, 30E20

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Application of Jacobi wavelets for solving nonlinear stochastic Itô-Volterra integral equations

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Abstract. We propose an optimization method, based on the Jacobi wavelets along with the Gauss-Legendre quadrature and Itô approximation, for solving nonlinear stochastic Itô-Volterra integral equations (SIVIEs). By applying these basis and approximations the nonlinear SIVIEs convert to a system of algebraic equations which can be solved by an appropriate numerical method.

Keywords: Jacobi wavelets, Stochastic Itô integral equations, Numerical method

Mathematics Subject Classification [2010]: 60H20, 45D05, 33C47

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K-frames and Bessel sequences

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Abstract. The K-frames were introduced by L. Găvruţa for Hilbert spaces to study atomic systems with respect to a bounded linear operator. In this article, we study the extensions of Bessel sequences in a Hilbert space H to K-frames. Indeed, we provide some conditions that under them, we can extend a Bessel sequence to a K-frames by adding finitely many elements of H.

Keywords: Bessel sequence, Frame, K-frame, Compact operator

Mathematics Subject Classification [2010]: 42C15, 47A05

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An extension of Wang's protein design model using Blosum62 substitution matrix

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Abstract. One of the problems that help us understand the relation between protein structures is the well-known protein design problem which attempts to find an amino acid sequence that can fold into a desired tertiary structure. However, despite having an acceptable accuracy in protein design, this accuracy is an identical percentage of amino acid retrieving. At the same time, it is well-known that amino acids can replace each other in evolution while the function and structure of protein stay the same. Thus the designed sequence does not have the opportunity to be close to the target in the evolutionary aspect. This paper presents an extension to Wang's deep learning model and uses evolutionary information in the Blosum62 substitution matrix to take amino acid replacement probability into account while designing a sequence.

Keywords: Protein design, Blosum matrix, Deep learning

Mathematics Subject Classification [2010]: 92-08

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On the construction of second derivative methods with inherent quadratic stabilit.

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Abstract. The purpose of this paper is to construct explicit Nordsieck second derivative general linear methods with inherent Quadratic Stability property which have large region of absolute stability. Examples of such methods of order $p = q + 1 = r = s$ are given and the stability regions are plotted together with those for general linear methods of the same order.

Keywords: General linear methods, Second derivative general linear methods, Nordsieck representation, Order conditions, Inherent RungKutta stability

Mathematics Subject Classification [2010]: 05C31, 05C70

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Approximately $C-$controlled $g-$dual frames

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Abstract. In this paper, approximately for controlled $g-$dual frames is defined and some of their properties are investigated. Finally, we characterize the relationship between approximately $C-$controlled dual and $C-$controlled $g-$dual.

Keywords: Frames, Controlled frames, $g-$dual frame, Approximate $g-$dua

Mathematics Subject Classification [2010]: 42C15, 42C99

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On GPW-(po-)flatness of S-posets

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Abstract. In [H. Rashidi, A. Golchin, H. Mohammadzadeh saany, On GPW-flat acts, Categories and General Algebraic Structures with Applications, 12(1) (2020), 175-197], the study of GPW-flatness property of right acts A S over a monoid S that can be described by means of when the functor A S âŁŮ S âĹŠ preserves some pullbacks is initiated. In this paper, we extend these results to S-posets and present equivalent description of GPW-po-flatness of S-posets. We show that GPW-flatness does not imply torsion freeness in S-posets and give some general properties and a characterization of pomonoids for which some other properties of their posets imply this condition.

Keywords: GPW-flat, GPW-po-flat, Weakly torsion free

Mathematics Subject Classification [2010]: 06F05, 20M30

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Second derivative multistage methods

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Abstract. In this paper, we describe construction of a class of explicit second derivative Runge–Kutta methods which have extensive region of absolute stability. Examples of such methods with $p = q = s = 1$ and 2 are given in which p and q stand for order and stage order, and s is the number of stages. These methods, because of their extensive stability region, can compete with the traditional explicit Runge–Kutta methods of the same order in solving initial value problems.

Keywords: Ordinary differential equations, Two-derivative Runge–Kutta methods, Order conditions, Stability

Mathematics Subject Classification [2010]: 65L05

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Cycle structure of elements of permutation groups with movement m or $m-3$

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Abstract. Let G be a permutation group on a set *Omega* which has no fixed points in *Omega* and let m be a positive integer. Suppose that G has bounded movement m and every non-identity element of it has movement m or $m-3$. In this paper, we determine the cycle structure of elements of G.

Keywords: Permutation group, Transitive, Movement, Cycle

Mathematics Subject Classification [2010]: 20B05

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Irreducible filters of eRM-algebras

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Abstract. In this paper, we introduce and study the concept of irreducible filters of eRM-algebras and investigate some of them properties. In particular, we show that the set of all filters of a eRM-algebra $\mathcal{X}$ is a chain if and only if every proper filter of $\mathcal{X}$ is prime.

Keywords: RM-algebra, eRM-algebra, (irreducible, prime, maximal) Filter

Mathematics Subject Classification [2010]: 06D20, 06F35, 03G25

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A characterization of p-normed spaces based on some quasi norm inequalities

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Abstract. In this talk, we state a characterization of p-normed spaces which is based on the generalized triangle inequality of the second type and its reverse in quasi normed spaces. More exactly, for a quasi normed space $(X, \|.\|)$ and $0 < p \leq 1$ we obtain some regions of $\mathbb{R}^n$ which contain the set of all n-tuples $(\mu_1, \ldots, \mu_n)$ satisfying $\sum_{i=1}^{n} \frac{\|x_i\|^p}{\mu_i} \leq \| \sum_{i=1}^{n} x_i \|^p$, for all $x_1, \ldots, x_n \in X$.

Keywords: p-normed space, Quasi normed space, Generalized triangle inequality of the second type.

Mathematics Subject Classification [2010]: 46A16, 47A30, 46B20

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On strongly (P)-cyclic right Rees factor acts

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Abstract. By a regular act we mean an act such that all its cyclic subacts are projective. In this paper we introduce strong (P)-cyclic property of acts over monoids which is an extension of regularity and give a classification of monoids by this property of their right Rees factor acts.

Keywords: Strongly (P)-cyclic, Right PCP, Rees factor act

Mathematics Subject Classification [2010]: 20M30

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Poisson burning of graphs

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Abstract. Graph burning is a deterministic discrete-time graph process that is defined on the vertex set of a simple finite graph and can be considered as a model for the spread of social contagion. Its corresponding graph parameter is called the burning number and can be interpreted as a measure for the speed of contagion. In this paper, we define the textbfPoisson burning process on the vertex set of a finite simple graph as a random variation of the graph burning process. We also define its corresponding graph parameter, called textbfburning time. We then obtain a general asymptotic upper bound on the burning time of connected graphs, and we find the asymptotic order of the burning time for the paths.

Keywords: Poisson burning, Burning time

Mathematics Subject Classification [2010]: 05C57, 05C85

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Some results of effectiveness in metric model theory

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Abstract. This article presents an approach to verify the effective versions of theorems and concepts in metric model theory. Metric model theory (continuous logic) is a framework to study mathematical analysis and the corresponding spaces. So, a suitable way to study computability is Type-two-theory of effectivity(TTE). By TTE, effective version of some theorems in metric model theory can be obtained.

Keywords: Metric model theory, TTE, Omitting types theorem, Definability

Mathematics Subject Classification [2010]: 65F10, 65F50

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On coregualr S-Acts

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Abstract. This paper shall be concerned with the notion of coregular S-acts (acts which all their cyclic subacts are injective) over a monoid S as a dual concept of regular acts. We present various properties and some homological classifications of coregular S-acts. Also the relations between these kinds of acts and some properties around injectivity are investigated.

Keywords: Right S-act, Coregular, Smiretractable

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The oriented coloring of generalized Theta graphs

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Abstract. We study oriented coloring of Theta graphs. An oriented coloring of an oriented graph $\overrightarrow{G}$ is a vertex coloring of $\overrightarrow{G}$ such that (i) no two adjacent vertices have the same color and (ii) all the arcs between any two color classes have the same direction. The oriented chromatic number of $\overrightarrow{G}$ is the smallest integer k such that $\overrightarrow{G}$ admits an oriented coloring with k colors. In this paper we prove that oriented chromatic number of any oriented generalized Theta graph lies between 2 and 6 and that these bounds are tight.

Keywords: Oriented coloring, oriented chromatic number and generalized Theta graph

Mathematics Subject Classification [2010]: 05C15, 05C20

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The game chromatic index of special graphs

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Department of Computer Engineering, Imam Javad University College, Yazd, Iran

Abstract. In this paper, the game chromatic index $K_{2,n}$, Cartesian product $P_2 \square P_n$ and $P_2 \square S_n$ is studied, where $K_{2,n}$ is a complete bipartite graph, P_n is a path on n vertices and S_n is a star graph of order $n+1$. It is proved that $\chi'_g(K_{2,n}) = \chi'_g(P_2 \square S_n) = n+1$ for $n \geq 2$, $\chi'_g(P_2 \square P_n) = 3$ for $n = 2, 3$ and $\chi'_g(P_2 \square P_n) = 4$ for $n \geq 4$.

Keywords: Game chromatic index, Cartesian product

Mathematics Subject Classification [2010]: 05C15, 05C57

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Approximating the efficient border for nondifferential multi-objective problems

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[1]Department of Mathematics, Tabriz University, Tabriz, Iran

Abstract. In multi-objective convex optimization, we need to compute an infinite set of nondominated points. The proposed method for approximating an nondominated set of multi-objective nonlinear programming problem, is the extension of Benson's external approximation algorithm for multi-objective linear programming problems. In the case that the objective functions and constraints are differentiable, for implement the main step, we describe the effective method of "constructing a hyperplane separating an external point from the feasible set in the target space". In the case of non-differentiablility of objective functions and constraints, this method is not applicable. Therefore, we will use the generalized directional derivative and subdifferentials, then we re-examine and explain the algorithm for this case.

Keywords: Multi objective optimization, Differentiability, Sub-differential of convex functions, ε-nondominated point

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Co-prime graph of subgroups of a finite groups

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Abstract. Let G be a finite group. The coprime graph of subgroups of group is define by the set of all vertices are all subgroups and for any two distinct subgroups H and K of the vertex set are join if and only if $gcd(|H|, |K|) = 1$we denoted by $\Gamma_{cosg}(G)$. In the paper, we discussed the computing of the matrix degree sequences and the number of edges of some of the finite groups, Cyclic group C_n, Dihedral Group D_{2n} and Dicyclic group T_{4n}.

Keywords: Cyclic group, Dihedral group, Split graph

Mathematics Subject Classification [2010]: 50B10, 05C07, 05C50

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Group actions on irreducible characters: applications to local-global conjectures for groups of type A

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Abstract. The aim of this paper is to study the Brauer program on classifying finite groups with isomorphic complex group algebras. More precisely, we first show that a large family of almost simple groups of type A are uniquely determined up to isomorphism by the structure of their complex group algebras. For this purpose, we need to understand the action of automorphisms on irreducible characters. The second part of the paper is devoted to study the action of automorphisms of quasi-simple groups of type A on the set of their irreducible characters. Consequently, we give a short proof of the global side of the inductive McKay condition for irreducible characters of groups of type A.

Keywords: Automorphisms, Irreducible characters, Finite groups of Lie type

Mathematics Subject Classification [2010]: 20C15, 20C33

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On the eigenvalues inclusion sets of stochastic tensors

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Abstract. The purpose of this paper is to locate and estimate the eigenvalues of stochastic tensors. We present several estimation theorems about the eigenvalues of stochastic tensors. Meanwhile, we obtain the distribution theorem for the eigenvalues of the tensor product of two stochastic tensors. We will conclude the paper with the distribution for the eigenvalues of generalized stochastic tensors.

Keywords: Inclusion sets, Nonnegative tensors, Stochastic tensors

Mathematics Subject Classification [2010]: 15A18, 15A69

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Some results on the essential graph of $\mathbb{Z}_n$

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Abstract. Let R be a commutative ring. The essential graph of R, denoted by $EG(R)$ is a simple graph associated to R with vertex set $Z(R) \setminus \{0\} = Z(R)^*$, and a pair of distinct vertices x and y are adjacent if and only if $\mathrm{Ann}(xy)$ is an essential ideal of R. In this paper, we investigate the concept of the dominating set for the essential graph of $\mathbb{Z}_n$.

Keywords: Essential graph, Zero divisor graph, Domination number

Mathematics Subject Classification [2010]: 13Cxx , 05C25

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Left contractibility FC-algebras in terms of multi-norms

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Abstract. The notion of a multi-norm space was introduced by Dales and Polyakov. It generalizes that of a normed linear space E, which has one norm, by a taking a sequence of norms, one on each of the n-fold product spaces of E with itself. In this paper we investigate equivalent condition left contractibility on FC-algebras to the language of multi-norms. We then apply this result for the group algebra $L^1(G)$ for a locally compact group G.

Keywords: Multi-norms, F-algebras, Locally compact group

Mathematics Subject Classification [2010]: 43A07, 43A20, 22D15, 46H25

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Amenability and Super-amenability of generalized Feichtinger algebras

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Abstract. Let G be a locally compact group (not necessarily abelian) and B be a homogeneous Banach space on G, which is in a good situation with respect to a homogeneous function algebra on G. Feichtinger showed that there exists a minimal Banach space B_{min} in the family of all homogenous Banach spaces C on G, containing all elements of B with compact support. In this paper, we study the amenability and super amenability of B_{min}.

Keywords: Amenability, Super-Amenability, Homogenous Banach space, Homogeneous function algebra, IN-group

Mathematics Subject Classification [2010]: 47J30, 30H05, 46A18

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Fixed points of expansive mappings in modular G-metric spaces

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Abstract. In this paper, we define the concept of modular G-metric spaces introduced by Azadifar and Maramaei [1]. Further, we prove some fixed point theorems for expansive mappings in modular G-metric spaces.

Keywords: Modular G-metric space, Expansive mapping, G-metric space, Fixed point

Mathematics Subject Classification [2010]: 47H10, 46A80

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Domination in intuitionistic fuzzy incidence graph

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Abstract. In this article, we have defined the domination on Fuzzy incidence graph (FIG) by the valid edges on it and mentioned the results. We studied domination in terms of valid private neighborhood and irredundant set. Also, we presented an application of domination in this graph.

Keywords: Fuzzy incidence graph, Intuitionistic fuzzy incidence graph, Incidence dominating set, Valid private neighborhood

Mathematics Subject Classification [2010]: 18A32, 18F20, 05C65

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On the essential graph of a finite commutative ring

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Abstract. Let R be a commutative ring. The essential graph of R, denoted by $EG(R)$ is a graph associated to R with vertex set $Z(R) \setminus \{0\}$ and a pair of distinct vertices x and y are adjacent if and only if $\mathrm{Ann}(xy)$ is an essential ideal of R. In this paper, we calculate the domination, the clique and the chromatic numbers of the essential graph of a finite commutative ring.

Keywords: Essential graph, Domination number, Clique number, Chromatic number

Mathematics Subject Classification [2010]: 05C25

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ADI spectral element method for the solution of nonlinear time-fractional Schrödinger equation

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Abstract. In this work, we propose a numerical scheme for the solution of two dimensional time fractional nonlinear Schrödinger equation. To this end, for the time stepping, an alternating direction implicit (ADI) method based on a scheme of order $O(\tau)$ is given and for space discretization, spectral element method is used. We present the error estimate of proposed method. To demonstrate the accuracy and efficiency of method, a test problem is presented.

Keywords: Time-fractional Schrödinger equations, ADI spectral element method, Error estimate

Mathematics Subject Classification [2010]: 65M12, 65M06, 65M60

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On amenability-like properties of certain matrix algebras with applications

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Abstract. In this paper, we show that the class of $I \times I$ matrices with finite ℓp-norm is always pseudo-amenable, where $1 \leq p \leq 2$. As an application, for the case $p = 1$, we give some applications for semigroup algebras. Also we study approximate homological notions for the class of upper triangular matrix algebras with respect to the Esslamzadeh-Munn algebras.

Keywords: Matrix algebras, Pseudo-amenability, Approximate biprojectivity

Mathematics Subject Classification [2010]: 46M10, 43A20, 46H05

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Q-ideals in MV-semimodules

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Abstract. In this paper, by using an MV-semiring and an MV-algebra, we present the new definition of MV-semimodule, study basic properties and find some examples of MV-semimodules. In following, we study Q-ideals in semirings (in special case, MV-semirings). Using MV-semimodules, we prove two theorems that provide general examples of Q-ideals in MV-semimodules.

Keywords: MV-semiring, MV-semimodule, Q-ideal

Mathematics Subject Classification [2010]: 16Y60, 06D35

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Existence and k-Mittag-Leffler-Ulam-Hyers stability results of k-generalized ψ-Hilfer boundary value problem

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Abstract. In this paper, we present a generalized ψ-Hilfer fractional derivative and set some of the generalized operator's properties. We give a generalized Gronwall inequality and present the definitions of the k-Mittag-Leffler-Ulam-Hyers stability and some related remarks. We prove some existence, uniqueness and k-Mittag-Leffler-Ulam-Hyers stability results for a class of boundary value problem for implicit nonlinear fractional differential equations and k-Generalized ψ-Hilfer fractional derivative. In addition, various examples are given in order to justify our results.

Keywords: ψ-Hilfer fractional derivative, Generalized Gronwall Inequality, Mittag-Leffler function, Ulam-Hyers stability

Mathematics Subject Classification [2010]: 26A33, 34A12

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Connection between the classical and relative Homological dimensions

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Abstract. Let R be a commutative Noetherian ring. The aim of this paper is studying the connection between the classical and relative homological dimensions with respect to a semidualizing module. It is shown that the relative homological dimensions have the ability to detect the regularity of R. Among other results, we give a characterization of dualizing modules via relative homological dimensions.

Keywords: Semidualizing module, Homological dimensions

Mathematics Subject Classification [2010]: [2010]13D05, 13B02

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$\mathbb{F}_q\mathbb{F}_q[u]$-additive skew cyclic codes

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Abstract. In this paper, we characterize the algebraic structure of $\mathbb{F}_q\mathbb{F}_q[u]$-additive skew cyclic codes, where $u^2 = 0$. Also, we provide new methods to determine the structure of skew cyclic codes of length s over $\mathbb{F}_q[u]$. We classify that there are eight different types of explicit generators of $\mathbb{F}_q\mathbb{F}_q[u]$-additive skew cyclic codes.

Keywords: Skew cyclic code, Additive code

Mathematics Subject Classification [2010]: 94B15, 16S36

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To investigate a multi-singular pointwise defined fractional q-integro-differential equation with application

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Abstract. In this study, by using the Caputo type q–derivative and the Riemann-Liouville type fractional q–derivative, we investigate a multi-singular pointwise defined fractional q–integro-differential equation under some boundary conditions on a time scale. New existence results rely on α-admissible map and the fixed point theorem for α-ψ-contraction map. Lastly, we present an example with application and some algorithms illustrate the primary effects.

Keywords: Singularity, Pointwise defined equations, Integral boundary conditions, Caputo q-derivation

Mathematics Subject Classification [2010]: 34A08, 34B16, 39A13

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An application of multivariate T^2 control chart for skewed distributed data

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Abstract. In this paper it is taken into consideration generalization of the multivariate Birnbaum-Saunders distribution that is useful in dealing with asymmetric data in various theoretical and practical problems. As an application, it is applied in an statistical quality control using multivariate Hotelling's T^2 control charts for skewed populations based on weighted standard deviation. The effectiveness of the presented model is demonstrated via the ARLs by an illustrative example and a simulation study.

Keywords: Birnbaum-Saunders distribution, Normal mean-variance mixture, Hotelling's T^2 control chart, Skewed population, Weighted standard deviation

Mathematics Subject Classification [2010]: 18A32, 18F20, 05C65

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BSE properties of little Bloch and Zygmund type spaces

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Abstract. In this paper, we investigate the Bochner-Schoenberg-Eberlein or briefly *BSE* properties of the little Bloch type spaces. We also give the corresponding results for the little Zygmund type spaces. In order to get our results, we use the relations between these spaces, the analytic Lipschitz algebras and the differentiable Lipschitz algebras on the closed unit ball of the complex plane.

Keywords: Little Bloch type spaces, Little Zygmund type spaces, Analytic Lipschitz algebras, Differentiable Lipschitz algebras, *BSE*-algebras

Mathematics Subject Classification [2010]: 46J15, 46E25, 46J10

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On the normally torsion-freeness of König ideals

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Abstract. Let I be a square-free monomial ideal in a polynomial ring $R = K[x_1, \cdots, x_n]$ over a field K, $\mathfrak{m} = (x_1, \cdots, x_n)$ be the graded maximal ideal of R, and $\{u_1, ..., u_{\beta_1(I)}\}$be a maximal independent set of minimal generators of I such that $\mathfrak{m}\backslash x_i \notin \mathrm{Ass}(R/(I\backslash x_i)^t)$ for all $x_i | \prod_{i=1}^{\beta_1(I)} u_i$ and some positive integer t, where $I\backslash x_i$ denotes the deletion of I at x_i and $\beta_1(I)$ denotes the maximum cardinality of an independent set in I. In this paper, we prove that if $\mathfrak{m} \in \mathrm{Ass}(R/I^t)$, then $t \geq \beta_1(I) + 1$. As an application, we verify that under certain conditions, every unmixed Konig ideal is normally torsion-free, and so has the strong persistence property.

Keywords: Associated primes, Normally torsion-free ideals, Strong persistence property, Konig ideals, Corner-elements

Mathematics Subject Classification [2010]: 20C15, 20D10, 20D05

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A Sannon's entropy bound

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Abstract. Entropy of a dynamical system is a scientific concept, as well as a measurable physical property that is most commonly associated with a state of disorder. Estimation of topological entropies from naive numerical simulation of dynamical systems is difficult. In this paper we give upper and lower bounds for Shannon's entropy of a probability distribution (with the use of uniformly convex functions).

Keywords: Shannon's entropy, Jensen's inequality, Uniformly convex function, Bounds, Refinements

Mathematics Subject Classification [2010]: 37B40, 26A51, 37A35

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An efficient technique for solving state dependent delay differential equations

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Abstract. This work is devoted to introducing a new numerical method based on hybrid functions approximation for solving the neutral delay differential equations. First, we present the main properties of hybrid functions consisting of the block–pulse functions and Bernoulli polynomials. Then we utilize these properties to reduce the solution of neutral delay differential equations to a set of algebraic equations by first expanding the candidate function as hybrid functions with unknown coefficients. We use the collocation method to obtain the coefficients of the hybrid functions and discuss the error analysis. Finally, we solve some examples to demonstrate the high precision of the new technique.

Keywords: Neutral delay differential equation, Bernoulli polynomials, Error analysis

Mathematics Subject Classification [2010]: 41A10, 65G99, 34K28

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Injectivity and regular injectivity in bf PosAct-S

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Abstract. In this paper, we first study monomorphisms and regular monomorphisms and show that monomorphisms in bf PosAct-S are exactly one-one morphisms and regular monomorphisms in bf PosAct-S are exactly order embeddings. Then recalling the fact that the category bf Pos does not have any non-trivial (non-singleton) injective object with respect to monomorphisms, we see that bf PosAct-S has no non-trivial injective object, too. Then we study regular injectivity, that is, injectivity with respect to regular monomorphisms.

Keywords: Poset act, Injective poset act, Regular injective poset act

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On the some properties of generalized groups

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Abstract. In this article we introduce generalized groups as an extension of the structures of groups. It is an algebraic structure which has a background in the unified gauge theory and it has been studied first in 1999 by M.R. Molaei. We will review their structures and properties and we will give some examples and obtain some results in this subject.

Keywords: Generalized group, Generalized subgroup, Group

Mathematics Subject Classification [2010]: 20Nxx

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Category of graph automaton

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Abstract. In this note, at first, by using the notion of zero-forcing set, we present the notion of graph automata, which is called GA. We show that for a given graph and for some zero forcing sets, various GA will be obtained. Also, we show that there exists a functor from the category of graphs to the category of nondeterministic automata. Thereafter, we prove that there is a functor from the category of graphs to the category of general fuzzy automata.

Keywords: Automata, Category, Graph

Mathematics Subject Classification [2010]: 18B20, 68Q70

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Construction of Implicit-Explicit multivalue methods of high order and stage order for ODEs

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Abstract. In this paper, we construct a class of numerical methods for solving initial value problems of differential equations which have both non-stiff and stiff parts. Such systems can be solved by a class of implicit-explicit (IMEX) diagonally implicit multistage integration methods (DIMSIMs), where the non-stiff part and stiff part are treated by explicit and implicit formulas, respectively. Assuming that the implicit part of methods is $L-$stable, we construct methods of order $p = 5$ and $p = 6$ and stage order $q = p$, with large absolute stability regions and show their efficiency by applying to some well-known problems.

Keywords: IMEX methods, General linear methods, Order conditions, Stability analysis

Mathematics Subject Classification [2010]: 65L05

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On modules with only finitely many small submodules

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Abstract. In this article we introduce and study concept of modules with only finitely many small submodules (briefly, fs-module). Using this concept, we show that M is a fs-module if and only if $J(M)$ has only finitely submodules. Also, we show that if M is a fs-module, with non-zero small submodule, then $Soc(M) \neq 0$ and M is not semisimple. In particular, we prove that M is a fs-module if and only if $M = M_1 \oplus M_2$, where M_1 is semisimple and M_2 is a fs-module that $soc(M_2) \ll M$. Further, we prove if R is a right us-ring, then the Jacobson radical $J = J(R)$ is a minimal right ideal of R and $J^2 = 0$ and each right ideal A of R is either simple or non-small. Also, we show that if R is a commutative ring, then R has finite hollow dimension if and only if $\frac{R}{J(R)} \cong \oplus_1^n F_i$, where F_i is a field and conclude that if R be a semiprime local right fs-ring with finite hollow dimension, then R is a division ring.

Keywords: us-Modules, fs-Modules

Mathematics Subject Classification [2010]: 16P60, 16P20, 16P40

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A cohomological approximate invariant for Banach algebras

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Abstract. We introduce a new invariant in context of Banach algebras named approximate Hochschild cohomology and we study the relation between this notion and approximate amenability. This allows us to extend the notion of cohomology groups to approximate cohomology groups and study their properties. We also reconstruct the classical results in this respect.

Keywords: Approximate invariant, Approximate amenability, Approximate Hochschild cohomology

Mathematics Subject Classification [2010]: 46M20, 46M18, 46H25

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Dominating sets in the perpendicular graphs of modules

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Abstract. Let R be a ring with identity and M be an R-module. Two modules A and B are called orthogonal, written $A \perp B$, if they do not have non-zero isomorphic submodules. Perpendicular graph of M defined as the graph $\Gamma_{\perp}(M)$, with the vertex set $\mathcal{M}_{\perp} = \{(0) \neq A \leq M | \exists (0) \neq B \leq M ; \text{such that; } A \perp B\}$ and two distinct vertices A and B are adjacent if and only if $A \perp B$. In this paper we study dominating set of $\Gamma_{\perp}(M)$.

Keywords: Dominating set, Orthogonal submodules, Perpendicular graph

Mathematics Subject Classification [2010]: 05C25,16D10

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On p-subgroups of central automorphism group of a finite p-group

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Abstract. Let G be a group and $L_c(G)$ be the central kernel of G, that is the set of all elements of G fixed by all central automorphisms of G. Also let $\mathtt{Aut}_{L_c}(G)$ denote the group of all central automorphisms of G fix $G/L_c(G)$ elementwise. In this paper, we give some results on the group $\mathtt{Aut}_{L_c}(G)$, where G is a finite p-group.

Keywords: Automorphism group, Central kernel, Central autocommutator subgroup, Finite p-group

Mathematics Subject Classification [2010]: 20D45, 20D25, 20D15

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Right Tr-contractibility of the convolution algebra of Trace class operators

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Abstract. Let G be a locally compact group. The convolution algebra of trace class operators $(\Gamma(L^p(G)), *)$ with $p \in (1, \infty)$, is a new Banach algebra, that was introduced by M. Neufang [5]. In this paper, we study $(\Gamma(L^p(G)), *)$ in the view of one of the important properties of Banach algebras, that is a notion of contractibility.

Keywords: Locally compact group, Nuclear operators, Right ϕ-contractibility

Mathematics Subject Classification [2010]: 22D05, 47B10, 43A07

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The heavy ball GMRES based on tensor format for Sylvester tensor equations

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Abstract. The restarted GMRES based on tensor format (GMRES_BTF(m)) is a tensor Krylov method that can solve Sylvester tensor equations. When the GMRES_BTF procedure is restarted, the current search space is thrown away at each restart. This leads to slow convergence. In this paper, we present a technique for accelerating the convergence of restarted GMRES_BTF by retaining some information from previous cycles. We take inspiration from the heavy ball method in optimization to derive the algorithm. A numerical example is given to show the efficiency of the proposed method.

Keywords: Tensor Krylov subspace, Heavy ball GMRES method based on tensor format

Mathematics Subject Classification [2010]: 65F10

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On some properties of intuitionistic fuzzy modules

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Abstract. In this talk at first we recall the class of intuitionistic fuzzy modules and then present some properties of them. Also we introduce a special class of intuitionistic fuzzy modules and study on them. Exact sequences in category of intuitionistic fuzzy modules is introduced and investigated.

Keywords: Intuitionistic fuzzy set, Intuitionistic fuzzy modules, Exact Sequences

Mathematics Subject Classification [2010]: 03E72, 06F25

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Symmetric methods based on triple-jump composition for solving periodic differential equations

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Abstract. In this paper, symmetric methods by composition technique are constructed which are applicable to general time-reversible ordinary differential equations (ODEs). Here, the aim is to increase the order while preserving some desirable properties of the basic method. To show the advantages of the proposed methods, some periodic problems are tested.

Keywords: Ordinary differential equations, Symmetric methods, Composition methods

Mathematics Subject Classification [2010]: 65L05

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Analytic torsion on manifolds with fibred boundary metrics

Mohammad Talebi*

Abstract. In this paper, we construct the renormalized analytic torsion in the setup of manifold endowed with fibred boundary metrics. The method of construction is to determine the asymptotic of heat kernel, both in short time regime and long time regime and apply these asymptotics together with renor- malization to determine the renormalized zeta function and the determinant of Hodge Laplacian.

Keywords: Analytic torsion, Spectral geometry, Spectral invariant, Global analysis

Mathematics Subject Classification [2010]: 32C05

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On χ-connes module amenability and χ-module normal virtual diagonals

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Abstract. In this paper, we define χ-Connes module amenability of a semigroup algebra $l^1(S)$, where χ is a bounded module homomorphism from $l^1(S)$ to itself and S is an inverse weakly cancellative semigroup with subsemigroup E_S of idempotents. We investigate and study of χ-module normal, virtual diagonals. Realy, we obtain some inherited properties for semigroup algebra $l^1(S)$ over $l^1(E_S)$ via mentioned diagonals.

Keywords: χ-Connes module amenable, χ-module normal virtual diagonal, Inverse semigroup algebra, Module ψ-derivation, Weakly cancellative semigroup

Mathematics Subject Classification [2010]: 43A20, 43A10, 22D15

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Homological properties of quadratic quotients of the Rees algebra

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Abstract.

Let R be a commutative ring and let $I \neq 0$ be a proper ideal of R. In this paper, we study some homological properties of a family of rings $R(I)_{a,b}$, with $a, b \in R$, that are obtained as quotients of the Rees algebra associated with the ring R and the ideal I. This family provides a unified approach to Nagata's idealization and to amalgamated duplication.

Keywords: Von Neumann regular ring, Global dimension

Mathematics Subject Classification [2010]: [2010]13D05, 13B02

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A polynomial-time algorithm for finding most vital edges in min-max spanning tree problems

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Abstract. A min-max spanning tree problem is to find a spanning tree in a weighted graph so that the maximum amount of its weights is minimized. This paper considers the problem in the presence of a proactive adversary. His goal is to remove some edges of the graph under a budget constraint so that the optimal value of the problem is increased as much as possible. Such the edges is called most vital edges. In this paper, a polynomial-time algorithm is proposed to find most vital edges in min-max spanning tree problems.

Keywords: Most vital edges, Spanning tree, Polynomial-time algorithm, Cut

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Three-point methods with memory based on Kung-Traub's method for solving nonlinear equations

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Abstract. In this work, we have proposed a family of with-memory Kung-Traub-like three-step methods. Also, by using an accelerator parameter, we have increased the convergence order of the with-memory methods to twelve. We have increased the degree of convergence from 8 to 12, which shows a 50% improvement. Several examples are considered to illustrate the proposed method is accurate and efficient.

Keywords: With-memory method, Accelerator parameter, Nonlinear equation

Mathematics Subject Classification [2010]: 65B99, 65BXX

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A time delay model for COVID-19

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Abstract. In this paper, using time delay differential equations, a mathematical model for viral disease COVID-19 is introduced. Two time delays are considered. τ_1 is the time interval between infection and the onset of symptoms and τ_2 is the reinfection time interval in recovered individuals. As fallow, the stability in disease free equilibrium point and stability in endemic equilibrium point when the time delays are zero is investigated. Finally, the solution curves when the time delays are nonzero are drawn.

Keywords: Time delay differential equation, Dynamical model, Asymptotically stable

Mathematics Subject Classification [2010]: 34D20, 37G10

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Gradient Einstein-type manifold

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Abstract. We derive a lower bound for potential function of extended gradient Einstein-type metrics on a complete non-compact Riemannian manifold. Moreover, it's proved that any gradient Einstein-type manifold is homeomorphic to interior of a compact manifold with boundary, that is, it's of finite topological type, provided that either $Ric \geqslant \delta^{-1} g$ and the injectivity radius $inj(M, g) \geqslant \delta > 0$ for some $\delta > 0$ or the Ricci tensor Ric is bounded above.

Keywords: Ricci soliton, Einstein-type manifold, Quasi-Einstein

Mathematics Subject Classification [2010]: 53C25, 53C20

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An unprecedented monadic filter in monadic BL-algebras

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Abstract. In this paper, we introduce and consider a new type of monadic filters in monadic BL-algebras, Gödel monadic filters. We define the notion of Gödel monadic filters on monadic BL-algebras and some basic properties of them are determined. Therefore, using this concept and their vital properties, representable monadic BL-algebras are characterized.

Keywords: Modular G-metric space, Expansive mapping, G-metric space, Fixed point

Mathematics Subject Classification [2010]: 08B50, 03G25, 03B52

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On skew power series McCoy rings

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Abstract. Let R be a ring with an endomorphism $alpha$. A ring R is a skew power series McCoy ring if whenever any non-zero power series $f(x) = \sum_{i=0}^{\infty} a_i x^i$, $g(x) = \sum_{j=0}^{\infty} b_j x^j \in R[[x;\alpha]]$ satisfy $f(x)g(x) = 0$, then there exists a non-zero element $c \in R$ such that $a_i c = 0$, for all $i = 0, 1, \ldots$. We investigate relations between the skew power series ring and the standard ring-theoretic properties. Moreover, we obtain some characterizations for skew power series ring $R[[x;\alpha]]$, to be McCoy, zip, strongly AB and has Property (A).

Keywords: Noetherian ring, α-compatible ring, Skew Power series McCoy ring, Zip ring, Reversible ring

Mathematics Subject Classification [2010]: 16S50, 16D40, 16D70

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Moment estimation and model selection in univariate autoregressive models with non-normal innovations

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Abstract. In this paper we consider the estimation, order and model selection of autoregressive model which may be driven by non-normal innovations. We provide method for order and model selection, i.e. for selecting the order of the autoregression and the model for the innovation's distribution. Our analysis provides analytic results on the asymptotic distribution of the method of moments estimators and also computational results via simulations. It is shown that focussed information criterion is appropriate for model selection arising from autoregressive models with non-normal innovations based on the method of moments estimators.

Keywords: Autoregressive order selection, Focussed information criterion, Method of moments estimation, Misspecified model, Nonnested models

Mathematics Subject Classification [2010]: 62M10, 62F10, 62F12, 62H12

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Hypergroupoids associated with a metric space

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Abstract. In this paper, we associate some weak commutative hypergroupoids with a given metric space and obtain some results in this respects. We show that these hypergroupoids are weak commutative H_v-groups. Also, we determine some conditions for these hypergroupoids such that be hypergroups.

Keywords: Hypergroupoid, H_v-group, Hypergroup, Metric space

Mathematics Subject Classification [2010]: 20N20, 54E35

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A combination method to solve the system of nonlinear Volterra integral equations

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Abstract. In this paper, an efficient combination approach based on quasilinearization and spectral collocation methods is proposed for solving a system of nonlinear Volterr integral equations of the second kind. Throughout this process, the nonlinear system is turned into a sequence of the linear systems and solved using Legendre spectral collocation method. An illustrative example is provided to verify the efficiency and accuracy of the method.

Keywords: System of nonlinear Volterra integral equations, Quasilinearization method, Legendre spectral collocation method

Mathematics Subject Classification [2010]: 18A32, 18F20, 05C65

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Abstracts

Part 2: Posters

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Vorticity on the compact Riemannian manifolds

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Abstract. The vorticity is important in most of the fluid problems. Also, two dimensional manifolds are especially important in fluid mechanics. In this paper, we use the geometric analysis to obtain vorticity as the flow on the any 2- dimensional compact Riemannian manifold (M,g). Especially, we explain vorticity flow on the 2−dimensional sphere.

Keywords: Vorticity, NavierStokes equations, Compact Riemannian manifold

Mathematics Subject Classification [2010]: 53C21, 76D05, 57N16

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Symmetrical hybrid WENO schemes based on the identification of extreme points

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Abstract. The aim of this work is to design a fifth-order hybrid WENO scheme in the framework of finite difference. By finding the extreme points of the reconstruction polynomial, the scheme (MHyWENO) automatically adapts between the linear upwind scheme and a hybrid WENO scheme. By comparing the numerical results of MHyWENO and traditional WENO, the efficiency and robustness of MHyWENO is revealed.

Keywords: UNO limiter, ENO reconstruction, Hyperbolic conservation laws, Computational efficiency

Mathematics Subject Classification [2010]: 65M06, 35L65

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Planar iterated line graphs of $\Gamma_I(R)$

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Abstract. Let R be a finite commutative ring and I be a non-zero ideal of R. The ideal-based zero-divisor graph of R with respect to the ideal I, denoted by $\Gamma_I(R)$, is the graph on vertices $\{x \in R \setminus I \mid xy \in I \text{ for some } y \in R \setminus I\}$ where distinct vertices x and y are adjacent if and only if $xy \in I$. In this talk, we study planarity of the iterated line graphs of the ideal-based zero divisor graphs. We give a complete characterization of all these graphs with respect to their planar index.

Keywords: Ideal-based zero divisor graph, Planar index, Iterated line graph

Mathematics Subject Classification [2010]: 05C50, 13A70

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On the capacity of sum-networks based on characteristic of the finite field

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Abstract. A sum-network is an instance of a function computation problem over a finite field of information observed at all the sources nodes. In this paper, we consider a family of sum-networks whose network coding capacity is dependent on message alphabet (specifically the characteristic of the finite field) chosen for communication. Our work described construction that improved previous results in this line by demonstrating sum-networks with significantly fewer number of sources and terminals.

Keywords: Network coding, Sum-Network, Coding Capacity, Function Computation.

Mathematics Subject Classification [2010]: 94A24, 94A29, 94B35

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Lyapunov function for a compartmental model in epidemiology

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Abstract. Mathematical modeling has become an important and useful tool in studying the spread and control of infection disease. The basic reproduction number,is one of the most useful threshold parameters which characterize mathematical problem concerning infections diseases. In this paper,we using Lyapunov techniques for study the stability and asymptotic stability of dynamical systems. and revisit a classical result.

Keywords: Lyapunov function, Infection models, Epidemiology, Global stability

Mathematics Subject Classification [2010]: 37C75, 93A30

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Finite sum of weighted composition pprators on the Hardy spaces

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Abstract. The study of weighted Composition Operators on various function Spaces has received considerable attention in past decades. Characterizations, which usually involve the interplay of symbol functions, for Certain type of weighted Composition operators, have been obtained. In 2012 Jabbarzadeh and Estaremi determine the lower and upper estimates for the essential norm of a finite sum of weighted composition Operator on L^p-space under certain Condition. By introducing this operator on H-spaces. The aim is to find the algebra of weighed Composition operators on Hardy spaces. In this paper we determine the apper estimates for the norm p of the finite sum of weiyhted composition oprators on H^p-spaces and find condition that weighted composition oprators is starlike.

Keywords: Weighted composition operator, Essential norm, Hardy space

Mathematics Subject Classification [2010]: 18A32, 18F20, 05C65

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A simple method for finding private solution of Riccati equation

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Abstract. For solving many of problems in physics, optimal control and mathematics, we need to solve Riccati differential equation. The analytic solution of this problem is not simple and requires a private primary solution, because this equation is non-linear. Therefore, we use numerical methods for solving this problem. Once we have the private solution, Riccati equation turns into a first-order linear equation and would be solved easily. In this article, we represent a simple and easy method for finding private solution of a class of Riccati equation. Numerical examples are solved through this method. We can find the analytic solution for the equation using this method.

Keywords: Nonlinear differential equation, Private solution, Riccati equation

Mathematics Subject Classification [2010]: 34L99, 34B15

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Visual question answering on CLEVR dataset via multimodal fusion and relational reasoning

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Abstract. Visual question answering is a new interdisciplinary research area, in which the model attempts to answer a free-form question in natural language based on a given image. In this paper we improve an existing model, which leverages relational networks and attention mechanism, by decreasing its train and inference time while preserving a comparable accuracy.

Keywords: Visual question answering, Visual reasoning, Multi-modal learning, Deep Learning

Mathematics Subject Classification [2010]: 68T10, 68T45, 68T50

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An equivalent definition of the J-set

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Abstract. Let x be a vector in Banach space X over the field $\mathbb{C}$ and T stands for a bounded linear operator acting on X, then the operator T is called hypercyclic, if the orbit of the vector x under operator T is dense in X. The notion of hypercyclicity was localized by J-sets. We will introduce an equivalent definition of the J-set.

Keywords: Hypercyclic operators, Topologically transitive operators, J-class operators

Mathematics Subject Classification [2010]: 47A16, 37B99, 54H99

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Transcorneal drug delivery enhanced by ultrasound-in silico experiments

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[2]Department of Mathematics, Faculty of Sciences, Fasa University, Fasa, Iran

[3]Department of Mathematics, University of Coimbra, Coimbra, Portugal

Abstract. In this paper we present an exploratory study on the drug delivery to the anterior segment of the eye through the cornea enhanced by ultrasound. To increase corneal permeability and, consequently, to increase the drug transport, ultrasound is used. The drug delivery is then described by a set of partial differential equation for the propagation of the acoustic pressure waves generated by ultrasound and for the drug concentration in the different corneal layers. Preliminary numerical experiments illustrating the stimulus effects are included.

Keywords: Ultrasound, Mathematical model, Numerical simulation

Mathematics Subject Classification [2010]: 65N06

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Existence and uniqueness of positive solutions for a class of integro-differential equations

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Abstract. By using Banach contraction principle and Leray-Schauder's nonlinear alternative fixed point theorem, we study the existence and uniqueness of positive solutions for a class of nonlinear integro-differential equations of Caputo type fractional order with three points boundary conditions. Finally, two examples are presented to clarify the applicability of the main results.

Keywords: Fractional integro-differential equation, Boundary value condition, Fixed point theorem, Positive solution

Mathematics Subject Classification [2010]: 34A08, 26A33, 35B33

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Asymptotic properties of the robust regression-based on censored and functional data

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Abstract. In this work, I study a robust version of the local linear regression of the censored scalar response random variable, from a functional random variable X. I construct an estimator by combining both local linear ideas and M-estimation techniques. The main results of this work are the establishment of the almost complete convergence as well as the asymptotic normality for the constructed estimator. These asymptotic results are stated with rate and are proved under a general condition.

Keywords: Local linear method, Robust estimation, Censored data

Mathematics Subject Classification [2010]: 65F10, 65F50

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Biderivations and amenability of a pair of Banach algebras

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Abstract. In this paper, we introduce the concept of amenability for a pair of Banach algebras and we investigate the relation between the existence of derivations on two Banach algebras A and B and the existence of a biderivation on the pair (A, B). Then we study the relation between amenability of a pair of Banach algebras and amenability of the related Banach algebras.

Keywords: Biderivation, Inner biderivation, Biamenability

Mathematics Subject Classification [2010]: 46H20, 46H25

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Stochastic maximum principle of Markov regime switching forward stochastic differential equations with jumps

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Abstract. In this paper, we study a stochastic maximum principle of Markov regime switching forward stochastic differential equations with jumps-diffusion in infinit horizon. Sufficient and necessary maximum principles for optimal control under partial informa- tion are deriven. We illustrate our results by a problem of optimal consumption problem from a cash flow with regime.

Keywords: Stochastic maximum principle, Optimal control, Partial information, Regime switching

Mathematics Subject Classification [2010]: 93E20, 60H10

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Qualitative analysis of nonlinear fractional q-difference coupled system with q-integral boundary conditions via topological degree theory

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Abstract. In this manuscript, we study the existence and uniqueness results for a coupled system of nonlinear fractional q-difference subject to nonlinear more general four-point boundary conditions. The relevant results rely on the topological degree for condensing maps via a priori estimate method and the Banach contraction principle fixed point theorem. Finally, Two examples are presented to show the validity and also the effectiveness of the theoretical results is specified. In the last part of the paper, we conclude our exposition with some final remarks and observations.

Keywords: Fractional differential equations system, Fractional q-derivative, Topological degree theory, Condensing maps, Existence and uniqueness

Mathematics Subject Classification [2010]: 34A08, 26A33, 34B15

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Integral pseudo MTL-algebras

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Abstract. Pseudo MTL-algebras or weak pseudo BL-algebras are noncommutative structures arise from pseudo t-norm, namely, pseudo BL-algebras without the pseudo- divisibility condition. In this paper, we introduce the special classes of pseudo MTL- algebras and we call it integral pseudo MTL-algebras. Also, integral filters of pseudo MTL-algebras are defined and studied.

Keywords: (pseudo) BL-algebra, Integral (pseudo) MTL-algebra, Integral filter

Mathematics Subject Classification [2010]: 13D45, 39B42

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Existence fixed point in orthogonal b-metric spaces

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Abstract. Very recently, many authors extended orthogonal metric spaces and discussed on fixed points for several various contractive mappings in spaces. In this article we extend the notion of orthogonal metric space to orthogonal *b*-metric space. We obtain several fixed point results concerning this mapping in the framework of new spaces, which is called orthogonal *b*-metric spaces. Also, all main results, new definitions and theorems are supported by some interesting example.

Keywords: Fixed point, O-set, Orthogonal b-metric space

Mathematics Subject Classification [2010]: 47H10, 54H25

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Numerical solution of generalized fractional Volterra integro-differential equations via approximation the Bromwich integral

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Abstract. In this paper, we consider the generalized fractional Volterra integro-differential equations with the regularized Prabhakar derivative and represent the solution of this type of equations in the form of Bromwich integral in the complex plane. Then we select the hyperbolic contour as an optimal contour to approximate the Bromwich integral. Further, an example to show absolute errors for various parameters by using our numerical scheme on hyperbolic contour is given.

Keywords: Generalized fractional Volterra integro-differential equations, Hyperbolic contour, Bromwich integral

Mathematics Subject Classification [2010]: 26A33, 34C20

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A stochastic model for Zika virus transmission

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Abstract. In this paper we develop and analyze a mathematical model for the transmission of Zika virus. Firstly we construct stochastic environment because of parameters random essence, and introduce Zika epidemic model in stochastic form. Moreover, the equilibria of the system is considered. Finally, disease-free equilibrium point of the model and biologically feasible region for this dynamical system are presented.

Keywords: Zika virus, Stochastic modeling, Stochastic differential equation,Transmission simulation

Mathematics Subject Classification [2010]: 92C60, 93A30, 60H10

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Geometric relationships on hom-Lie color algebra extensions

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Abstract. In this paper we introduce notions of hom-Lie color algebra and investigate some basic results on it. A hom-Lie color algebra is a quadruple $(\mathfrak{L}, [.,.], \epsilon, \alpha)$ with some property. We study (non-Abelian) extensions of a given hom-Lie color algebra and characterize an extension of a hom-Lie color algebra $\mathfrak{L}$ by another hom-Lie color algebra $\mathfrak{h}$ and discuss the case where $\mathfrak{h}$ has no center.

Keywords: Hom-Lie algebra, Hom-Lie color algebra, Extensions of hom-Lie color algebra

Mathematics Subject Classification [2010]: 17B56, 17B75, 17B40

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Woven frame and Riesz Basis in Hilbert C^*- Modules

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Abstract. In this paper we introduce modular frame, woven modular frame in Hilbert C^*-modules. And we study some definitions and basic properties of Hilbert C^*-modules and woven frames , Riesz basis in Hilbert C^*-modules.Under what conditions can a sequence be turned into a modular frame in Hilbert C^*-modules? Also we show that every woven modular Riesz basis is a module frame.

Keywords: Frame, Woven frame, Modular frame, C^*-modules

Mathematics Subject Classification [2010]: 46L99, 42C15, 46H25

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Redundancy of linear codes based on finite rings

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Abstract. For linear codes based on finite fields, the Gilbert-Varshamov bound is a benchmark in measuring the efficiency in terms of the trade-off between overhead and error correction capability. In this paper we study redundancy of linear codes based on finite rings. We use the probabilistic method to obtain Gilbert-Varshamov type redundancy bounds for linear codes based on arbitrary finite rings and with a given relative distance.

Keywords: Linear codes, Finite rings, Redundancy, Probabilistic method

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New inequalities for entropy and Tsallis entropy of two accretive operators

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Abstract. The following important inequality for the relative operator inequality have been proven by Raissoli et al.

$$\mathcal{R}(S(A|B)) \geq S(\mathcal{R}A|\mathcal{R}B).$$

We give a reverse inequality to above mentioned inequality under some conditions. we also present some new inequality for sector matrices involving the relative operator entropy.

Keywords: Accretive operators, Entropy, Tsallis entropy

Mathematics Subject Classification [2010]: 15A45, 15A60, 47A63

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On the solvability of three-pair networks

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Abstract. This paper presents a property to diagnose the solvability of a class of three-pair networks using region decomposition method. The proposed property considers basic region graph which the topological structure of it is more simple than the original network.

Keywords: Three-pair networks, Region decomposition, Solvability

Mathematics Subject Classification [2010]: 68Q06, 68M10, 94A05

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Best proximity point for $(\alpha - \psi)$-contractive mapping

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Abstract. Fixed point theory is one of the most powerful tools in nonlinear analysis, there are a lot of results on this topic. In this paper we consider the class of $(\alpha - \psi)$-contractive mapping, and prove that the existence of best proximity point results for such mapping, can be concluded from the corresponding result in fixed point theory.

Keywords: Best proximity point, Fixed point, $(\alpha - \psi)$-contractive mapping, α-admissible, Non-self-mapping

Mathematics Subject Classification [2010]: 54H25, 47H10

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Lower and upper bounds for varentropy and varextropy

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Abstract. In this paper, we provide bounds for the variance of a function of random variables in terms of Chernoff-type inequalities. In fact, we obtain bounds for the varentropy and varextropy of random variables, in terms of measures of reliability and information theory. Moreover, we obtain an equivalence relation for cumulative residual entropy via covariance identity.

Keywords: Entropy, extropy, Varentropy, Varextropy, Chernoff inequality

Mathematics Subject Classification [2010]: 60E15

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A variational approach for some singular elliptic problems

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Abstract. By using variational methods (a critical point result for differentiable functionals), we establish the existence of infinitely many weak solutions for some singular elliptic problems involving a p-Laplace operator, subject to Dirichlet boundary conditions in a smooth bounded domain in $\mathbb{R}^N$. A concrete example is presented to illustrate the main result.

Keywords: Singular problem, p-Laplace operator, Variational methods, Critical point

Mathematics Subject Classification [2010]: 35J35, 35J60

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Investigating the relationship between the number of sessions attended in online math classes and students' final exam

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Abstract. The purpose of the research was the study of the relationship between the number of attendance sessions and final evaluation of students in university. The method of the research was correlational. The statistical population was all students in Islamic Azad University, Shahrood Branch who had one of the lesson Calculus I, II or equation diffrential in the first semester academic year of 1399-1400. 109 people were chosen as sample size. The results showed there is a positive and significant relationship between the scores obtained in final exam and the number of attendance sessions.

Keywords: Class attendance, Final score

Mathematics Subject Classification [2010]: 97-11

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Rglt-majorization on $\mathbf{M}_{n,m}$ and its linear preservers

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Abstract. Let $\mathbf{M}_{n,m}$ be the set of all n-by-m real matrices. A matrix R is called generalized row stochastic (*g-row stochastic*) if the sum of entries on every row of R is one. For $A, B \in \mathbf{M}_{n,m}$, it is said that A is *rglt-majorized* by B, and we write $A \prec_{rglt} B$, if there exists an m-by-m lower triangular g-row stochastic matrix R so that $A = BR$. In this paper, the concept right lower triangular generalized row stochastic majorization, or rglt- majorization, is investigated and then the linear preservers and strong linear preservers of this concept are characterized on $\mathbb{R}_n$ and $\mathbf{M}_{n,m}$.

Keywords: G-row stochastic matrix, (Strong) Linear preserver, Rglt-majorization

Mathematics Subject Classification [2010]: 15A04, 15A21

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Linear maps on algebra of operators in Hilbert C^*-modules characterized by action on zero products

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Abstract. Let M be a Hilbert C^*-module on a commutative C^*âĹŠalgebra with unit element e. In this paper, we are going to characterize the linear maps like δ, τ from $\mathrm{End}_A(M)$ into itself, satisfying $S\tau(T) + \delta(S)T = 0$ whenever $S, T \in \mathrm{End}_A(M)$ and $ST = 0$ and we try to express some results.

Keywords: Hilbert C^*-modules, Generalized derivations

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Interior inverse problems for a Sturm-Liouville operator with an impulse

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Abstract. This paper deals with the spectral boundary value problems for the SturmLiouville operator having an impulse. We prove the uniqueness of the potential and the coefficients of the boundary conditions by the interior point method.

Keywords: Interior inverse problem, Sturm-Liouville operator, Impulse, Spectrum

Mathematics Subject Classification [2010]: 34A55, 34B24

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Parametric type of the Jensen-Fisher information divergence

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Abstract. In this work, we first consider the Fisher information and then propose Jensen-Fisher information type of parameter and Jensen-chi square divergence measures. Then, we provide some connections between these measures with some known informational measures such as chi-square divergence, Kullback-Leibler, Jeffreys and Jensen-Shannon divergences.

Keywords: Fisher information, Jensen-Fisher information, Chi-square divergence, Jensen-Shannon Entropy

Mathematics Subject Classification [2010]: 18A32, 18F20, 05C65

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Positive solutions for a class of nonlinear fractional integro-differential equation involving Caputo-Hadamard fractional derivative

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Abstract. In this work, we prove the existence and uniqueness of positive solutions for a boundary value problem of nonlinear fractional integro-differential equations involving Caputo-Hadamard fractional derivative with integral boundary conditions. The technique used to prove our results depends on the upper and lower solution, the Schauder fixed point theorem and the Banach contraction principle. An example is given which illustrate the effectiveness of the theoretical results.

Keywords: Fractional integro-differential equations, Positive solutions, Upper and lower solutions, Fixed point theorem

Mathematics Subject Classification [2010]: 34A08, 34A12, 34B18

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Existence of weak solutions to nonlinear problem with Neumann boundary conditions

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Abstract. This work is devoted to the mathematical study of a new proposed model based on a Perona- Malik equation combined with a heat equation. This study shows how system of partial differential equations can be used to restore a digital image. By using compactness method and the monotonicity arguments, with suitable assumptions on the nonlinearities, we prove the existence of the weak solution for the proposed model which its consistency is given in our work.

Keywords: Topological degree, Nonlinear system, Homotopy

Mathematics Subject Classification [2010]: 35Q30, 65N12, 76M25

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Rings with specific lie ideals

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Abstract. We show that if I is a non-central Lie ideal of a ring R with $Char(R) \neq 2$, such that all of its non-zero elements are invertible, then R is a division ring. We prove that if R is an F-central algebra and I is a Lie ideal without zero divisor such that the set of multiplicative cosets $\{aF|a \in I\}$ is of finite cardinality, then either R is a field or I is central. We show the only non-central Lie ideal without zero divisor of a non-commutative central F-algebra R with $Char(R) \neq 2$ and radical over the center is $[R, R]$, the additive commutator subgroup of R.

Keywords: Division ring, Lie ideal, Quaternion algebra

Mathematics Subject Classification [2010]: 16K40, 17A35

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A CIP method for solving PDEs problem on an unbounded domain by using artificial boundary conditions

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Abstract. In this paper, we propose a basis set approach by the Constrained Interpolation Profile (CIP) method for the solution of partial differential equations on an unbounded domain.Two exact artificial boundary conditions are introduced to reduce the original problem into an initial boundary value problem with a finite computational domain. We present a three stage numerical scheme Laplace transform in time variable, the CIP method and Talbot's method for numerical inversion of the Laplace transformation. Efficiency of the scheme is demonstrated by numerical results of sample problem.

Keywords: CIP method, Unbounded domain, Artificial boundary conditions, Laplace transform, Talbot's method

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A new asymmetric distribution generated by Laplace distribution

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Abstract. In this paper, a new method is proposed for generating families of contin- uous distributions. It is used for the classic Laplace distribution and a new class of asymmetric continuous distributions is introduced. Some mathematical properties of the new distribution are provided. In particular, rth moment, variance, skewness, kurtosis are derived. Also, the asymptotic distribution of the extreme order statistics are inves- tigated. Using the maximum likelihood estimation method the proposed distribution is fitted to the set of real data and by AIC and BIC criteria the goodness of fitting the proposed distribution is demonstrated.

Keywords: Classic Laplace distribution, Two-sided Laplace transform, Asymmetric distribution

Mathematics Subject Classification [2010]: 60E05, 62E10

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A new numerical method for time fractional KdV-Burgers equations

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Abstract. In this paper, we propose a numerical method for time-fractional KdV- Burgers equations. After a discretization in time, a basis of polynomials is introduced to include the homogeneous boundary conditions. We propose a Petrov-Galerkin method with this basis to reformulate the problem as a system of algebraic equations with sta- bility and convergence theorems. Some numerical experiments are provided.

Keywords: KdV-Burgers equation, Spectral method, Fractional PDE

Mathematics Subject Classification [2010]: 35R11, 65M22, 76M22

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Some fixed point theorems for weak contraction in Q-fuzzy metric spaces

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Abstract. In this paper, we define weak contraction mappings in generalized fuzzy metric space. We also prove several common fixed point theorems for mappings in generalized fuzzy metric space.The purpose of this paper is to obtain fixed point theorems for weak contraction on Q-fuzzy metric spaces. We also provide an example verifying and illustrating the fixed point theorem.

Keywords: Fixed point, Generalized fuzzy metric, Weak contraction, Common fixed point

Mathematics Subject Classification [2010]: 47H10, 54H25, 54A40

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RD-Injectivity from a different perspective

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Abstract. We study the notion of RD-injectivity from a different perspective. A module M is said to be $A-RD$-subinjective if for every RD-extension B of A, every homomorphism from A to M can be extended to a homomorphism from B to M. The RD-subinjectivity domain of a module M, $\underline{RDI}^{-1}(M)$, is defined to be the collection of all modules A such that M is A-RD-subinjective.

Keywords: RD-Injective module; RD-Projective module; A-RD-Subinjective module

Mathematics Subject Classification [2010]: 16D80; 16D10; 16D50

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Some results on generalized module maps and ideal submodules of Finsler modules

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Abstract. Let E and F be Finsler modules over C^*-algebras A and B, respectively. In this talk, we state the notion of ideal submodules and unitary operators on Finsler modules and investigate some features of them. In particular, we show that for a $*$-homomorphism $\varphi : A \to B$, a surjective φ-module map $T : E \to F$ is a unitary operator if and only if φ is a bijection and T is an isometry. Finally, introducing the concepts of bi-generalized unitary equivalence and the induced Finsler modules, we show that the Finsler B-module F and the induced Finsler A-module E are unitary equivalent.

Keywords: (Full) Finsler modules, Hilbert C^*-module, Unitary operator

Mathematics Subject Classification [2010]: 46L08

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On (para)uniform MV-algebras

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Abstract. In this paper, the notions of (para) uniform MV-algebras are defined and continuity of the operations of the uniform MV-algebras are studied. Also, some uniform topologies are obtained by ideals. Then, it is proved that an MV-algebra with induced topology by congruence relation on ideals turn into a topological MV-algebra.

Keywords: MV-algebra, Ideal, (Para) Uniform MV-algebra, Uniform topology

Mathematics Subject Classification [2010]: 54E15, 06D35, 11F23

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A workflow scheduling algorithm based on lattice theory

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[2]Department of Computer, University of Kashan, Kashan, Iran

Abstract. Nowadays, cloud computing is widely utilized to execute workflows which represent a wide range of scientific applications. Scheduling the tasks of these workflows is the main activity in this field based on could computing criteria such as execution cost and time. In this paper, an algorithm is presented to minimize the cost of scheduling a workflow according to the execution time. We demonstrate a bijective function between lattices and workflows. Based on this relation, we prove the proposed scheduling algorithm is non-stop and feasible. Finally, our approach is compared with some well-known scheduling algorithms. The simulation results show that the proposed method can be more effective in reducing the costs of running workflows.

Keywords: Cloud computing, Lattice, Partial ordered set, Workflow scheduling, Critical path

Mathematics Subject Classification [2010]: 03G10, 68M20, 05C21

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On a generalization of classical notion of the ring

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Abstract. This talk is about some basic facts and new results on Γ-rings, as a generalized notion of the classical ring, which have been obtained over the past years. In particular, under the condition that the given Γ-ring is semi-prime some properties associated to Γ-rings imply each other. Moreover, some outlines about new researches of the subject under discussion are given.

Keywords: Multiplication, Ring, Γ-ring

Mathematics Subject Classification [2010]: 16N60, 16W25, 16Y99

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On reciprocal complementary Wiener number of cactus chains graphs

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Abstract. The reciprocal complementary Wiener number of a connected graph G is defined as the sum of weights $\frac{1}{D+1-d_G(u,v)}$ over all unordered vertex pairs in a graph G, where D is the diameter of G and $d_G(u,v)$ is the distance between vertices u and v. In this paper, we study the reciprocal complementary Wiener number of some cactus chains graphs.

Keywords: Reciprocal complementary Wiener number, Distance, Cactus chains

Mathematics Subject Classification [2010]: 05C12, 05C35

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The generalize of the absolute central automorphisms group

Mohammad Mehdi Nasrabadi[1] and Sara Barin[1,*]

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Abstract. In this paper, by a definition we generlize the absolute central automorphisms and represent their properties. after a new definition, n-absolute central automorphisms, we give our main results about the generalize of the absolute central automorphisms group, specially for p-groups, non-abelian groups, finite groups, and nilpotent groups of class 2.

Keywords: Absolute central automorphism, n-absolute central automorphism, Autonilpotent group, n-autonilpotent group

Mathematics Subject Classification [2010]: 20D45, 20D15, 20E36

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Classical ring of quotients of rings of continuous integer-valued functions

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Abstract. Let X be a zero-dimensional Hausdorff topological space. The classical ring of quotients of the factor ring $C(X,\mathbb{Z})$ is fully characterized. In particular, in a natural way, we observe that the classical ring of quotients of $C(X,\mathbb{Z})$ is equal to the ring of all rational-valued locally constant functions on X, i.e., $L(X,\mathbb{Q})$.

Keywords: Zero-dimensional space, Von Neumann regular ring, $\aleph_0$-self-injective ring, I-ring

Mathematics Subject Classification [2010]: 54C40

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On high-order stability of spacelike hypersurfaces in Lorentz-Minkowski space

Firooz Pashaie*

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Abstract. In this paper, we study the kth stability of spacelike hypersurfaces in the Lorentz space L^{n+1}. The stability of order k (briefly, k-stability) is a natural extension of the ordinary stability. The k-stability is defined based on the linearized operator L_k as an extension of the Laplace operator (i.e. $L_0 = \Delta$). We give sufficient conditions or a bounded domain in a k-maximal hypersurface of the Lorentz-Minkowski space to be k-stable. Especially, in the case $k = 1$, the Gauss- Kronecker curvature of 1-stable hypersurfaces has to be null on a special submanifold.

Keywords: K-maximal hypersurface, K-Stability, Minkowski space

Mathematics Subject Classification [2010]: 53C42, 53C20, 53B30

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Existence of weak solutions for a dispersive wave equation with strong damping, nonlinear boundary source term and interior logarithmic nonlinearity

Amir Peyravi*

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Abstract. In this talk, we are dealing with an initial-boundary value problem for a class of dispersive wave equations with strong damping, nonlinear boundary source term and interior logarithmic nonlinearity. We prove the existence of local weak solutions by using the Galerkin approximation method and the Banach fixed point theorem.

Keywords: Wave equation, Logarithmic nonlinearity, Existence

Mathematics Subject Classification [2010]: 35A01, 35B45, 35D30

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Two major concepts in fractal calculus: Staircase function $S_C^\alpha(x)$ and characteristic function $\chi_C(x)$

Amir Pishkoo*

Physics and Accelerators Research School, Nuclear Science and Technology Research Institute (NSTRI), Tehran, Iran

Abstract. In this article, we study the Cantor set, the integral staircase function, and the characteristic function. These concepts are required to define smooth and differentiable structures on fractals. First, the unique properties of the Cantor set are presented. Then, we show how to draw the Cantor function interactively in the Jupyter notebook environment.

Keywords: Fractal, Cantor set, Staircase function, Characteristic function

Mathematics Subject Classification [2010]: 28A80

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A characterization of values (l, m) such that $(l, m) \in \sum(q)$

Zahra Pourshafiey*

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Abstract. A length ml, index l quasi-cyclic code can be viewed as a cyclic code of length m over the
field $\mathbb{F}_{q^l}$ via a basis of the extension $\mathbb{F}_{q^l}/\mathbb{F}_q$. Let $\sum(q)$ be the set of all (l, m) values for one-generator length ml, index l quasi-cyclic codes C for which it is impossible to have an $\mathbb{F}_{q^l}-$linear image $\phi_\beta(c)$, for any choice of the polynomial basis. In this paper we characterize values (l, m) such that $(l, m) \in \sum(q)$.

Keywords: Cyclic code, Quasi-cyclic code, Additive cyclic code, Linear code

Mathematics Subject Classification [2010]: 94B15, 94B05

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(C, C')-Controlled g-Fusion Frames in Hilbert Spaces

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Abstract. In this paper we develop a theory based on g-fusion frames on Hilbert spaces, which provides exactly the frameworks not only to model new frames on Hilbert spaces but also for deriving robust operators. In particular, we can define analysis, synthesis and frame operators with representation space compatible for (C, C')-Controlled g-fusion frames, which even yield a reconstruction formula.

Keywords: G-fusion frame, Controlled fusion frame, Controlled g-fusion frame

Mathematics Subject Classification [2010]: 42C15, 42C40, 41A58

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On feedback queueing system with customers' impatience, multiple working vacations and Bernoulli schedule vacation interruption

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Abstract. In this work, we present an analysis of a Markovian feedback queueing system with customers' impatience, multiple working vacations and Bernoulli schedule vacation interruption [2], where customers' impatience is due to the servers' vacation. The stationary analysis is established. The probability generating functions of the stationary state probabilities is obtained the explicit expressions of the system sizes when the server is in a normal service period and in a Bernoulli schedule vacation interruption are deduced, respectively. Various performance measures of the system are derived. Finally, we present some numerical examples to demonstrate how the various parameters of the model influence the behavior of the system.

Keywords: Customers' impatience, Multiple working vacations, Bernoulli schedule vacation interruption

Mathematics Subject Classification [2010]: 60K25, 68M20, 90B22

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Antibiotics and Bacteria

Amir Rezaie*

Department of Mathematics, Zanjan University, Zanjan, Iran

Abstract. We analyze the population dynamics of bacteria competing by anti-bacterial toxins (antibiotics). Three types of bacteria involved in these dynamics can be distinguished: antibiotics producers, resistant bacteria and sensitive bacteria. Their interplay can be regarded as a Rock-Scissors-Paper game (RSP). In this paper, a mathematical model is presented to describe this phenomenon.

Keywords: Dynamical systems, Equilibrium points, Vector fields

Mathematics Subject Classification [2010]: 34H05, 34K20

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On C-epiretractable acts

Mohammad Roueentan[1,*] and Mohammad Ali Naghipoor[2]

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[2]Mohammad Ali Naghipoor, Department of Mathematics, Jahrom University, Jahrom, Iran

Abstract. Let S be a monoid. A right $S-$act A is said to be C-epiretractable if every cyclic subact B of A, is a homomorphic image of A. Our objective is to give some examples and characterizations of C-epiretractable acts by properties of underlying sets and investigate the relation between these properties with some other properties such as injectivity, projectivity and flatness.

Keywords: Right S-act, C-epiretractable , Generators

Mathematics Subject Classification [2010]: 20M30, 20M50

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On concircular transformations in Finsler geometry

Samaneh Saberali*

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Abstract. A geodesic circle in Finsler geometry is a natural extension of that in a Euclidean space. In this paper, we characterize Finsler manifolds admitting a concircular transformation such that the difference of the two Ricci tensors is a constant multiple of the metric. We characterize a concircular transformation with some PDEs on the tangent bundle, and then we obtain the solution.

Keywords: Geodesic circle, Concircular transformation, Ricci tensor, Scalar curvature

Mathematics Subject Classification [2010]: 53B40, 53C60

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Generalized harmonic analysis on the Amalgam spaces

Navid Sabzali*

Department of Mathematics, Behbahan Branch, Islamic Azad University, Behbahan, Iran

Abstract. In this paper, we deal with the amalgam spaces in the following way. Let G be a locally compact group and $p, q > 0$. In this paper, we investigate some inclusions and important properties of the amalgam space $L^{\pi}_{(p,q)}(G)$. Also in this work, we investigate the property that when $f * g$ exists, for all $f, g \in L^{\pi}_{(p,q)}(G)$, for the case that G an mathcal IN-group.

Keywords: Amalgam spaces, Uniform partition, IN-group

Mathematics Subject Classification [2010]: 47J30, 30H05, 46A18

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Characterization of $L_2(27)$ and $L_2(32)$ by the number of Sylow subgroups

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[2]Department of Mathematics, Shahrekord branch, Islamic Azad University, Shahrekord, Iran

Abstract. Let G be a finite group with trivial center and $n_p(G)$ be the number of Sylow subgroups of G. Put $L = L_2(q)$, where $q \in \{27, 32\}$, and suppose that $n_p(G) = n_p(L)$, for every prime $p \in \pi(G)$. In this paper we show that $G \cong L$, if $q = 27$, and $G \cong L$ or $\mathrm{Aut}(L)$, if $q = 32$.

Keywords: Projective special linear group, Sylow subgroup, Characterization

Mathematics Subject Classification [2010]: 20D06, 20D20

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Strongly p-limited completely continuous spaces

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[2]Department of Mathematics, Payame Noor University,Tehran, Iran

Abstract. By introducing strongly p-limited completely continuous subspaces of the space of operator ideals, it will be given some characterizations of this concept in terms of limited p-convergent of all its evaluation operators related to that subspace. In particular, when X^* or Y has the p-Gelfand-Phillips property (in short, p-GPP), we give a characterization of p-GPP of $\mathcal{M}$ of a closed subspace $\mathcal{M} \subset K(X,Y)$ in terms of strong p- limited complete continuity of $\mathcal{M}$.

Keywords: Weakly p-summable set, p- Gelfand-Phillips property, Operator ideals, Limited p-convergent

Mathematics Subject Classification [2010]: 94A24, 94A29, 94B35

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A computational method for second order boundary value problems by wavelets

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[2] 2Department of Basic Sciences, School of Mathematical Sciences, PO BOX 19395-3697, Payame Noor University, Tehran, Iran

Abstract. This paper proposed a method based on operational matrices of Chelyshkov wavelets for solving a boundary value problem of second order and transforms it to a system of linear equations. The integration operational matrices play an important role to obtaining a linear system of algebraic equations. Numerical examples are given to demonstrate applicability of this method.

Keywords: Chelyshkov wavelets, Operational matrix, Chelyshkov polynomials, Ordinary Differential Equations

Mathematics Subject Classification [2010]: 15A60, 46N40, 47N40

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Results on the monomial operations and normally torsion-freeness of monomial ideals

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Abstract. An ideal I in a commutative Noetherian ring R is called normally torsion-free if $\mathrm{Ass}_R(R/I^k) \subseteq \mathrm{Ass}_R(R/I)$ for all positive integers k. In this paper, by using some monomial operators such as expansion, weighted, monomial multiple, monomial localization, contraction, and deletion, we introduce several methods for constructing new normally torsion-free monomial ideals based on the monomial ideals which have normally torsion-freeness.

Keywords: Normally torsion-free ideals, Monomial operators, Associated primes

Mathematics Subject Classification [2010]: 13B25, 13F20

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Entropy for multi-valued mapps

Yamin Sayyari[1,*] and Mehdi Dehghanin[1]

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Abstract. In mathematics, a multi-valued function, also called set-valued function, is similar to a function, but may associate several values to each input. The complexity of multi-valued mapps is usually measured by the topological entropy. The aim of this paper is to give new definition of topological entropy (or just entropy) for multi-valued maps. Some related properties are also presented.

Keywords: Entropy, Multi-valued functions, Spanning set, Separated set

Mathematics Subject Classification [2010]: 37B40, 26E25, 37A35

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Stability and Hopf bifurcation of an autonomous chaotic system via time-delayed feedback control method

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[2]Department of Mathematics, Baghlan University, Pol-e-Khomri, Baghlan, Afghanistan

Abstract. This paper is concerned with the control of chaos in a chaotic dynamical system which is investigated by time-delayed feedback control technique. By designing appropriate feedback strength and delay, the chaotic system is controlled to be stable, or stable bifurcating periodic solutions emerge near an unstable equilibrium. Therefore, regarding the delay of the system as a bifurcation parameter and analyzing the characteristic equation of the corresponding linearized system, stability and the existence of Hopf bifurcation are theoretically proved. Furthermore, some numerical simulations are provided to examine the analytical results.

Keywords: Chaotic system, Chaos control, Time-delayed feedback, Stability, Hopf bifurcation

Mathematics Subject Classification [2010]: 18A32, 18F20, 05C65

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Inverse matroid optimization problem under Chebyshev distance

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[2]Institute for the Study of War, Army Command and Staff University, Tehran, Iran

Abstract. Given a matroid (S, L) and a utility vector c associated with elements of S, the inverse matroid optimization problem is to modify the vector **c** as little as possible such that a given set $I^0 \in L$ becomes a maximum independent set with respect to the modified utility vector. The modifications can be measured by different distances. In this paper, we consider the inverse matroid optimization problem under the Chebyshev distance. It is shown that the problem can be solved in polynomial time.

Keywords: Matroid, Inverse problem, Independent set, Chebyshev distance

Mathematics Subject Classification [2010]:

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Fuzzy quasi-uniformities by entourage

Maryam Yaghoubi*

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Abstract. Uniform structures on the fuzzy spaces are defined using different set of axioms and basic terms.In this paper we present another characterization of fuzzy uniformities in the style of Weil that we call it $\mathbb{T}$ - Weil uniformity. We formulated and investigated a definition of entourage uniformity alternative to that one of Hutton. It is expressed in terms of coproduct of fuzzy spaces. We have showed that every fuzzy topological space is $\mathbb{T}$ - Weil quasi-uniformizable.

Keywords: $\mathbb{T}$-fuzzy topological space, $\mathbb{T}$ - Weil uniformity, $\mathbb{T}$ - Weil quasi- uniformizable

Mathematics Subject Classification [2010]: 54A40,54E15

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The application of Hybrid methods between Tensor and Manifold theories in the image processing

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Abstract. Tensors as vector fields structures and manifolds as great geometrical-topological structures have many applications in the fields of big data, such as tensorial analysis methods, geometric and topological data analysis. Based on the types of norms, metrics, and scalable structures that have been defined on the data space, different methods could be defined for various data analysis purposes. Nowadays, the hybrid methods between tensorial algorithms and manifold learning (MaL) methods have been attracted some attention. In image and signal processing, from image recovery to face recognition, these methods have appeared very excellent. According to our experiments by **MATLAB R2020b**, the hybrid algorithms are powerful other than algorithms based on the universal popular parameters for comparing.

Keywords: Image Processing, Manifolds, Manifold Learning, Tensors, Tensor Completion

Mathematics Subject Classification [2010]: 15A69, 58J60, 68T07

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