KMD 2014

KARATEKİN MATHEMATICS DAYS 2014

INTERNATIONAL MATHEMATICS

SYMPOSIUM

PROCEEDINGS

11-13 June, 2014

Çankırı Karatekin University
Çankırı, TURKEY

Preface

"Karatekin Mathematics Days 2014 (KMD 2014)" organized by Çankırı Karatekin University will be held on June 11-13, 2014 in Çankırı, Turkey.

The aim of this symposium is to provide a platform for mathematicians to present their recent studies, and to create an opportunity to improve collaboration between local and international researchers so that they could exchange ideas and new methods within their fields of research. It is our strong belief that this platform will form a sound foundation for enhanced cooperation among academics from different fields of mathematics and development in academic researches in the field.

We would like to express our deepest gratitude to Prof. Dr. Ali İbrahim Savaş, President of Çankırı Karatekin University, for his invaluable support he provided through the whole conference process. Our sincere appreciation is extended to Çankırı Governorship, Çankırı Municipality, Çankırı Bar Association, Çankırı Chamber of Commerce and Industry, Çankırı Credit and Guarantee Cooperative for Tradesmen and Craftsmen, Çankırı Commodity Exchange, Çankırı Union of Tradesmen and Craftsmen Chambers for financially supporting this organization.

We would also like to express our sincere appreciation for the members of Scientific Committee and for all invited speakers whose invaluable presence greatly contributed to the conference.

Thank you very much in advance for your invaluable participation in Karatekin Mathematics Days 2014 (KMD 2014). We certainly look forward to welcoming you in Çankırı.

With warmest regards,
Assoc. Prof. Dr. Hakan Kasım AKMAZ,
Chairman of KMD 2014

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- Yusuf YAYLI (Ankara University, Turkey)

Invited Speakers

- Klaus Altmann (Freie Universität Berlin, Germany)
- Eberhard Malkowsky (Fatih University, Turkey/Giessen University, Germany)
- John Michael Rassias (National and Capodistrian University of Athens, Greece)
- Ivan Soprunov (Cleveland State University, USA)
- Vesna Veličković (University of Niš, Serbia)

Contents

INVITED SPEAKERS

Compactness in Banach spaces

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Abstract

The concept of *compactness* is fundamental and very general. It appears at various stages and levels in mathematics, in both teaching and research. We study the property of compactness in Banach spaces, and consider some measures of noncompactness; they are very useful tools and have applications metric fixed point theory, the theory of operator equations in Banach spaces, functional equations, ordinary, partial and fractional differential and integral equations, optimal control theory, and characterisations of compact operators between Banach spaces.

Keywords: *Compactness; Measures of noncompactness; Compact operators*

Visualization of mathematics by means of line graphics

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Abstract

In general, there is little understanding of the geometric shapes of mathematical objects and the mathematical community usually does not deal with visual information.

Visualization is a very young interdisciplinary field of mathematics. It strongly supports the understanding of mathematical concepts. The geometric shape of a curve or surface can give us better understanding for and feeling of mathematical problems, and, in some cases, even initiates further research.

We developed a software package for visualization of different kinds of curves and surfaces. It provides the tools for the creation of the graphics for the visualizations and animations.

We use Line Graphics and explain its properties.

Keywords: *Visualization; Line graphics; Software development*

Toric geometry in coding theory

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Abstract

Coding theory is concerned with detecting and correcting errors in data transmission. In 1982 Tsfasman, Vlăduţ, and Zink discovered that codes constructed from certain families of algebraic curves have better asymptotic parameters than any previous constructions. This motivated a great activity in applying methods of algebraic geometry to coding.

I will talk about a relatively new family of algebraic geometry codes called toric codes. A toric code is constructed by evaluating elements of a finite-dimensional space L of rational functions on a toric variety X at a finite set of points Z on X. We will see how basic parameters of a toric code depend on combinatorics of the space L and on geometry of the set of points Z.

Keywords: *Toric varieties; Toric codes; Algebraic geometry codes; Linear codes*

The exterior Bitsadze-Lavrentjev problem for quaterelliptic-quaterhyperbolic equations in a doubly connected domain

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Abstract

The famous Tricomi equation was established in 1923 by F.G. Tricomi, who is the pioneer of parabolic elliptic and hyperbolic boundary value problems and related problems of variable type. In 1945 F. I. Frankl established a generalization of these problems for the well-known Chaplygin equation. In 1953 and 1955 M.H. Protter generalized these problems even further. In 1977 we generalized these results in several n-dimensional simply connected domains. In 1950-1951 M.A. Lavrentjev and A. V. Bitsadze investigated the Bitsadze-Lavrentjev equation. In 1990 we proposed the exterior Tricomi problem. In 2002 we considered uniqueness of quasi-regular solutions for a bi-parabolic elliptic bi-hyperbolic Tricomi problem. In 2006 G.C. Wen investigated the exterior Tricomi problem for general mixed type equations. In 2011 we established the exterior Tricomi and Frankl problems for quaterelliptic - quaterhyperbolic equations. In this paper we investigate the exterior Bitsadze-Lavrentjev problem for quaterelliptic -quaterhyperbolic Bitsadze-Lavrentjev PDEquations with eight parabolic lines in a doubly connected domain and propose open problems. These problems are of vital importance in fluid mechanics.

Keywords: *Quasi-regular solution; Bitsadze-Lavrentjev PDEquation; Quaterelliptic equation; Quaterhyperbolic equation; Bitsadze-Lavrentjev problem*

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The geometry of T-varieties

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Abstract

The usage of toric varieties exploits the fact that the action of an n-dimensional torus on an n-dimensional variety allows to translate the algebro-geometric data into combinatorics. However, when deforming toric varieties, then this very symmetric structure is to rigid.

Motivated by the search for the versal deformation of toric singularities, we (together with Hausen and Suess) have developed a language that allows to describe lower-dimensional torus actions, too. If a k-dimensional torus acts on an n-dimensional variety, then this will correspond to some k-dimensional combinatorics, some (n-k)-dimensional geometry, and some interaction of both.

We will introduce this concept, and we will demonstrate how it helps to obtain a better understanding of our original problem of deforming toric varieties.

CODING, CRYPTOGRAPHY, GRAPH THEORY AND RELATED DISCRETE STRUCTURE (MINISYMPOSIUM)

$\mathbb{Z}_2\mathbb{Z}_4$-additive cyclic codes, generator polynomials and dual codes

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Abstract

A $\mathbb{Z}_2\mathbb{Z}_4$-additive code $\mathcal{C}$ is called cyclic code if the set of coordinates can be partitioned into two subsets, the set of $\mathbb{Z}_2$ and the set of $\mathbb{Z}_4$ coordinates, such that any cyclic shift of the coordinates of both subsets leaves invariant the code. These codes can be identified as submodules of the $\mathbb{Z}_4[x]$-module $\mathbb{Z}_2[x]/(x^\alpha - 1) \times \mathbb{Z}_4[x]/(x^\beta - 1)$. The parameters of a $\mathbb{Z}_2\mathbb{Z}_4$-additive cyclic code are stated in terms of the degrees of the generator polynomials of the code. The degrees of the generator polynomials of the dual code of a $\mathbb{Z}_2\mathbb{Z}_4$-additive cyclic code are studied.

Keywords: *Binary cyclic codes; Duality; Quaternary cyclic codes; $\mathbb{Z}_2\mathbb{Z}_4$-additive cyclic codes*

Acknowledgment: *This work has been partially supported by the Spanish MICINN grant TIN2013-40524-P and by the Catalan grant 2009SGR1224.*

Graph determination by its adjacency spectrum

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Abstract

Matrices have been used to represent the relations between the graph invariants, such as adjacency matrix, degree matrix, incidence matrix, etc. According to any graph matrix M, when two graphs have the same M-spectrum, they are called M-cospectral. Hence, for a given graph G, if all of the M-cospectral graphs with G are isomorphic to G, then G is called "Determined by its M-spectrum" and is denoted by DMS. If M is the adjacency matrix of the graph, it is denoted by DAS. In this study, we are focused on a well-known and hard problem that is finding on DAS or non-DAS graphs.

Keywords: *Graph spectrum; Spectral characterization of graph*

Factorization of Fermat numbers into a product of primes

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Abstract

The study of factorization of integers and especially Fermat numbers into product of primes is important because of intensive use in cryptology. Though Fermat himself thought that all numbers of the form $2^{2^n}+1$ are primes only first four Fermat numbers are known to be prime. So far no other Fermat primes are found. It follows from the Theorem of Euler and Lucas that the prime factors of the Fermat number $2^{2^n}+1$ are greater than 2^{n+2}, so are "large" (see [1]). Different methods are applied to find factorization of Fermat numbers (see [2] and [3]). We modify the Fermat's factorization method for factorization of Fermat's numbers. Using quadratic residues modulo 16, 32, 64 and other powers of 2 we eliminate impossible cases and so accelerate the process.

Keywords: *Fermat numbers; Cryptology; Fermat's factorization method*

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Codes over $\mathbb{F}_2[u]/(u^6)$ for DNA

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Abstract

In this paper, we study the structure of reversible cyclic codes over ring $F_2[u]/u^6$. Thus we obtain models for proteins and amino acids. We begin by a model of transcription of DNA into RNA, hence into amino acid. The obtained codes give us the 20 possible amino acids. We also study the edit distance for the genetic mutation.

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On codes over an infinite family of ring extension of the binary field and constructions for new binary self-dual codes

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Abstract

In this work, we introduce a generalization of rings of the form $\mathbb{F}_2 + u\mathbb{F}_2 + \cdots + u^k\mathbb{F}_2$ and $\mathbb{F}_2 + u\mathbb{F}_2 + v\mathbb{F}_2 + uv\mathbb{F}_2$ to a family of rings that we denote by $\mathcal{R}_{k,m}$, where $\mathcal{R}_{k,m} = \mathbb{F}_2[u,v]/\left\langle u^k, v^m, uv - vu\right\rangle$. We establish that this is a Frobenius, characteristic 2, family of rings that is non-chain when k and m are both greater than 1. We find a duality-preserving Gray map from $\mathcal{R}_{k,m}$ to $\mathbb{F}_2^{km}$, and using some of the common construction methods of self-dual codes we find many good binary self-dual codes as the Gray images of self-dual codes over $\mathcal{R}_{k,m}$ for suitable k and m. More precisely, we find the extended Golay code; 6 of the 41 extremal binary self-dual codes of length 36; 2 extremal self-dual binary codes of length 66; 175 **new** Type I binary self dual codes of parameters $[72, 36, 12]$ and 105 **new** Type II binary self-dual codes of parameters $[72, 36, 12]$.

Keywords: *Extremal self-dual codes; Gray maps; Codes over rings; MacWilliams identities*

Chain rings $F_2 + uF_2 + ... + u^{k-1}F_2, 1 \leq k \leq 8$ and S-box theory

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Abstract

Substitution boxes (S-boxes) are the elementary components in symmetric key cryptosystems. They toughen cryptosystem's cryptographic security and make them nonlinear. The S-boxes used in archetypal and modern cryptography are mostly constructed over finite Galois fields extensions of binary field F_2. Though, we already given a novel construction technique of S-boxes, based on the multiplicative cyclic subgroup $G_s$of group of units of the 256 elements Galois ring $GR(4, 4)$, whereas G_s of order 15 is isomorphic to the cyclic Galois group $GF(2, 4)\backslash\{0\}$. Regardless, in this study, we swing the structure to the commutative chain rings of finite even orders and built S-boxes centered on elements of 16 order subgroup of multiplicative group of units of the commutative chain ring $F_2 + uF_2 + ... + u^{k-1}F_2$. Majority logic criterion (MLC) is castoff to amount the effectiveness of proposed S-boxes.

Keywords: *S-boxes; Finite chain rings; Unit elements; Subgroup of order 16; MLC*

An analysis of S-box based on intuitionistic fuzzy soft sets

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Abstract

In this manuscript, we put forward a standard based on intuitionistic fuzzy decision making criterion to examine the current substitution boxes and study their strengths and weaknesses in order to decide their appropriateness in image encryption applications. These analysis apply to well known substitution boxes. The outcome of these analysis are additional observed and a intuitionistic fuzzy soft set decision making criterion is used to decide the suitability of an S-box to image encryption applications.

Keywords: *Soft set; Fuzzy set; Intuitionistic Fuzzy parameterized set; S-box; Advanced encryption standard (AES); Affine-power-affine (APA)*

Repeated-root isodual cyclic codes over finite fields

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Abstract

An isodual code is a linear code which is equivalent to its dual. The class of isodual codes is very important in coding theory, in particular because it contains the self-dual codes as a subclass. In addition, isodual codes are contained in the larger class of formally self-dual codes, and they are related to isodual lattices [1]. For some parameters, it can be shown that there are no cyclic self-dual codes over finite fields [3, 4], whereas cyclic isodual codes can exist. Several types of equivalence between codes can be defined [2]. Two codes C and C' are called monomially equivalent if there exists a monomial linear transformation, i.e., a permutation of the coordinates followed by multiplication of coordinates by nonzero field elements, which sends C to C'.

In this work cyclic isodual codes over finite fields are investigated. These codes are monomially equivalent to their dual. Existence results for cyclic isodual codes are given based on the generator polynomial, the field characteristic, and the length. Several constructions of isodual repeated-root cyclic codes and self-dual codes are given which have good minimum distance.

Keywords: *Repeated-Root cyclic codes; Equivalent codes; Isodual codes*

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Formally self-dual codes over $\mathcal{S}_4$

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Abstract

In this work, Gray images of formally self-dual codes over the ring $\mathcal{S}_4 = \mathbb{F}_2 + u\mathbb{F}_2 + u^2\mathbb{F}_2 + u^3\mathbb{F}_2 \simeq \mathbb{F}_2[u]/(u^4)$ and some of their construction methods are going to be considered. We get some extremal codes over $\mathcal{S}_4$ with large automorphism groups as Gray images of codes over $\mathcal{S}_4$.

Keywords: *Finite chain rings; Linear codes; Formally self-dual codes; Automorphism groups*

Computation of certain topological indices of nanotubes covered by C_5 and C_7

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Abstract

A topological index is a numeric quantity which represents the structure of a graph. A molecular/chemical graph is hydrogen depleted chemical structure in which vertices denote atoms and edges denote the bonds. There are certain types of topological indices like distance based, degree based and counting related topological indices. Among them degree based topological indices are of much importance due to their chemical significance. Carbon nanotubes, a type of fullerene, have potential in fields such as nanotechnology, electronics, optics, materials science and architecture.

In this article, we compute atom-bond connectivity (ABC), geometric-arithmetic (GA), Randić and zagreb indices of $VC_5C_7[p,q]$, $HC_5C_7[p,q]$ and $SC_5C_7[p,q]$ nanotubes. We also compute ABC_4 and GA_5 indices for these nanotubes.

Keywords: *Topological index; Nanotube; $VC_5C_7[p,q]$ nanotube; $HC_5C_7[p,q]$ nanotube; $SC_5C_7[p,q]$ nanotube*

On the nullity of a class of tripartite graphs

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Abstract

The eigenvalues of the adjacency matrix of a graph form the spectrum of the graph. The multiplicity of the eigenvalue zero in the spectrum of a graph is called nullity of the graph. Fan and Qian (2009) obtained the nullity set of n-vertex bipartite graphs and characterized the bipartite graphs with nullity $n-4$ and the regular bipartite graphs with nullity $n-6$. In this paper, we study this problem for the class of tripartite graphs. We characterize a subclass of tripartite graphs with nullity $n-2$ and $n-4$. We also discuss some graphs with nullity $n-6$ in this class.

Keywords: *Nullity; Tripartite graphs; Expanded path*

On MDS block codes over a finite ring

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Abstract

In this work, we give a new view of a generator matrix on standard form for block codes and we characterise an MDS block code over a finite ring via the smallest free code which contains it.

On the group based cryptography

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Abstract

There are too many applications of group theory. The recent application of group theory is public key (asymmetric) cryptography. All cryptographic algorithms have some weaknesses. To avoid it's weakness, some special groups and methods can be applied on. We will touch on group based public key cryptography and will give some suggestions in this area.

Keywords: *Groups; Public key cryptography; Cryptology; RSA*

On the multiplication of Jack symmetric functions and power symmetric functions

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Abstract

Let μ be any Young diagram and n be non-negative integer. In this work, using the Pieri rule for Jack symmetric functions, we find the formulas of the multiplication of Jack symmetric function J_μ and n-th power sum symmetric function p_n for adding n boxes to the same column of the Young diagram μ and for adding n boxes to the same row of the Young diagram μ. Also we obtain some results combinatorially.

Keywords: *Jack symmetric function; Power sum symmetric function; Pieri rule for Jack symmetric functions; Partition; Young diagram*

New databases of linear codes over $GF(11)$ and $GF(13)$

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Abstract

One central problem in coding theory is to optimize the parameters of a linear code and construct codes with best possible parameters. There are tables of best-known linear codes over finite fields of sizes up to 9. Recently, there has been a growing interest in codes over $GF(11)$, over $GF(13)$ and other fields of size greater than 9. The main purpose of this work is to present new databases of best-known linear codes over the fields $GF(11)$ and $GF(13)$ together with upper bounds on the minimum distances. To find good linear codes to establish lower bounds on minimum distances, an iterative heuristic computer search algorithm is employed to construct quasi-twisted (QT) codes over these fields with high minimum distances. A large number of new linear codes have been found, improving previously best-known results. Tables of $[pm, m]$ QT codes over the two fields with best-known minimum distances as well as a table of lower and upper bounds on the minimum distances for linear codes of length up to 150 and dimension up to 6 are presented.

Keywords: *Database of linear codes; Quasi-twisted codes; Heuristic search algorithm; Iterative search*

Prime number selection resistant to Fermat's factorization method for RSA cryptosystem

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Abstract

There are some benchmarks to be careful while selecting of primes p and q in RSA algorithm and the safety of these primes should be considered from different aspects. There are many varied algorithms to solve an encrypted text [1, 2]. Generally, a RSA algorithm is firstly tested by brute force. If the cipher couldn't be broken by existing algorithms, RSA algorithm is considered as secure and it is ready to use. In the elapsed time, new algorithms are produced to break RSA. Fermat's Factorization Method is one of these algorithms threatening RSA. With this method, in case the selected primes are close to each other, the number n can be separated into factors very easily. This study has been made to improve security of RSA against Fermat's Factorization Method and the other methods based on Fermat's Factorization Method. In RSA cryptosystem, for same-bit-length primes to be selected, the appropriate interval is determined considering Fermat's Factorization Method [3]. With the benchmark applied in the prime selection in RSA, it has been shown to be more reliable.

Keywords: *RSA; Fermat's factorization method; Cryptography; Cryptanalysis*

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A mathematical model of vertex connectivity problem in graphs

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Abstract

Let $G=(V,E)$ be a graph. The variables $x_i(i=\overline{1,n})$, $x_{ij}^{pq}(i=\overline{1,n}, j=\overline{1,n}, p=\overline{1,n-1}, q=\overline{p+1,n})$ defined as follows:

$$x_{ij}^{pq}=\begin{cases}1, & \text{if passing from i to j on the path } < p,q >\\ 0, & \text{otherwise}\end{cases}$$

$$x_i=\begin{cases}M, & \text{if the vertex } i \text{ deleted}\\ 1, & \text{otherwise}\end{cases}$$

where M is a large integer which satisfies the condition $M>n^2$.
A mathematical model of vertex connectivity problem in graphs can be written as follows:

$$\sum_{i=1}^{n} x_i \rightarrow min. \quad (1)$$

$$\sum_{i=1}^{n} x_{pi}^{pq} = 1, (i\neq p, p=\overline{1,n-1}, q=\overline{p+1,n}) \quad (2)$$

$$\sum_{i=1}^{n} x_{iq}^{pq} = 1, (i\neq q, p=\overline{1,n-1}, q=\overline{p+1,n}) \quad (3)$$

$$\sum_{i=1}^{n} x_{ik}^{pq} = \sum_{j=1}^{n} x_{kj}^{pq}, (k\neq p,q; k=\overline{1,n}, p=\overline{1,n-1}, q=\overline{p+1,n}) \quad (4)$$

$$\sum_{p=1}^{n-1}\frac{1}{x_p}\sum_{q=p+1}^{n}\frac{1}{x_q}\sum_{i=1}^{n}\sum_{j=1}^{n} x_{ij}^{pq}x_ix_j \geq M \quad (5)$$

$$x_{ij}^{pq} = 0\vee 1, (i=\overline{1,n}, j=\overline{1,n}, p=\overline{1,n-1}), q=\overline{p+1,n}) \quad (6)$$

$$x_i = 1\vee M, \text{under the constraints } (i=\overline{1,n}) \quad (7)$$

By using this model, we can obtain $\kappa(G)=\lfloor(\sum_{i=1}^{n} x_i)/M\rfloor$.

Keywords: *Graph algorithms; Vertex-connectivity; Mathematical modelling*

On the classification and identification situations by weighing

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Abstract

We study the problem of determining the minimum number m weighings necessary to identify up to t nonstandard objects out of the total number n tested objects. For the problem with fixed variance weights of nonstandard objects the perfect weighing algorithms are built with parameters $n = 11, m = 5, t = 2$, the relevant to the parameters of the ternary Virtakallio-Goley code. The nonexistence of a perfect weighing code with such parameters is proved.

Keywords: *Weighing; Finding fake coins; Classification algorithms*

A mathematical model of edge connectivity problem in graphs

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Abstract

Let $G = (V, E)$ be a graph. Variables $y_{ij}(i = \overline{1,n}, j = \overline{1,n})$, $x_{ij}^{pq}(i, j = \overline{1,n}, p = \overline{1,n-1}, q = \overline{p+1,n})$ are defined as follows:

$$x_{ij}^{pq} = \begin{cases} 1, & \text{if there exists a flow from } i \text{ to } j \text{ on path } < p, q > \\ 0, & \text{otherwise} \end{cases}$$

$$y_{ij} = \begin{cases} M, & \text{if vertex i is deleted} \\ 1, & \text{otherwise} \end{cases}$$

where M is a large integer which satisfies the condition $M > n^2$.

A mathematical model of the problem can be written as follows:

$$\sum_{i=1}^{n-1}\sum_{j=i}^{n} y_{ij} \to min. \quad (1)$$

$$\sum_{i=1}^{n} x_{pi}^{pq} = 1, (i \neq p, p = \overline{1,n-1}, q = \overline{p+1,n}) \quad (2)$$

$$\sum_{i=1}^{n} x_{iq}^{pq} = 1, (i \neq q, p = \overline{1,n-1}, q = \overline{p+1,n}) \quad (3)$$

$$\sum_{i=1}^{n} x_{ik}^{pq} = \sum_{j=1}^{n} x_{kj}^{pq}, (k \neq p, q; k = \overline{1,n}, p = \overline{1,n-1}, q = \overline{p+1,n}) \quad (4)$$

$$\sum_{p=1}^{n-1}\sum_{q=p+1}^{n}\sum_{i=1}^{n}\sum_{j=1}^{n} x_{ij}^{pq} y_{ij} \geq M \quad (5)$$

$$x_{ij}^{pq} = 0 \vee 1, (i = \overline{1,n}, j = \overline{1,n}, p = \overline{1,n-1}), q = \overline{p+1,n}) \quad (6)$$

$$y_{ij} = 1 \vee M, \text{under the constraints } (i = \overline{1,n}, j = \overline{1,n}) \quad (7)$$

We can obtain $\lambda(G) = \lfloor (\sum_{i=1}^{n-1}\sum_{j=i}^{n} y_{ij})/M \rfloor$ using model (1)-(7).

Keywords: *Graph Algorithms; Edge connectivity; Mathematical modelling*
Acknowledgement: F. Nuriyeva was partially supported by TUBITAK 2216 program.

On graph energy and some open problems

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Abstract

Let G be a finite and undirected simple graph, with vertex set $V(G)$ and edge set $E(G)$. The number of vertices of G is n and its vertices are labeled by $v_1, v_2, \ldots, v_n$. The adjacency matrix $A(G)$ of the graph G is a square matrix of order n, whose (i, j)-entry is equal to 1 if the vertices v_i and v_j are adjacent and is equal to zero otherwise. The graph energy is denoted by

$$E(G) = \sum_{i=1}^{n} |\lambda_i|$$

such that $\lambda_1, \ldots, \lambda_n$ are the eigenvalues of $A(G)$. In this study we present some known results about graph energy. Also we mention some open problems.

Keywords: *Graph; Adjacency matrix; Energy; Eigenvalues*

On super (a,d)-edge-antimagic total labeling of a class of tree

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Abstract

The concept of labeling has its origin in the works of Stewart (1966), Kotzig and Rosa (1970). Later on Enomoto, Llado, Nakamingawa and Ringel (1998) defined a super (a,0)-edge-antimagic total labeling and proposed a conjecture that every tree is a super (a,0)-edge antimagic total graph. In the favour of this conjecture, the present paper deals with different results on antimagicness of a trees, which is called subdivided stars.

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Bounds on the minimum distance of $\mathbb{Z}_{p^r}\mathbb{Z}_{p^s}$-additive codes

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Abstract

Recently, there are many studies related with additive codes. In this paper we give two bounds on the minimum distances of $\mathbb{Z}_{p^r}\mathbb{Z}_{p^s}-$additive codes and compare them. $\mathbb{Z}_{p^r}\mathbb{Z}_{p^s}-$additive codes are a new class of additive codes which generalize a lot of work about additive codes where p is a prime number and $1 \leq r < s$. We also give some examples of these additive codes that attain the bounds.

Keywords: *$\mathbb{Z}_{p^r}\mathbb{Z}_{p^s}$-additive codes; Singleton bound*

Optimal code families from Fibonacci polynomials

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Abstract

Fibonacci number sequences and error correcting codes are well known and studied subjects. They appear in a few papers together. In this work, we study cyclic codes that have generators as Fibonacci polynomials over finite fields. It turns out that such cyclic codes produce families of optimal codes with interesting properties. We explore this relations and present some examples.

Keywords: *Fibonacci polynomials; Cyclic codes; Optimal codes*

A study on a graph of monogenic semigroup

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Abstract

Recently, in a paper written by *Das* et al. [1], it has been defined a new graph $\Gamma(\mathcal{S}_M)$ on monogenic semigroups $\mathcal{S}_M$ (with zero) having elements $\{0, x, x^2, x^3, \cdots, x^n\}$. The vertices are the non-zero elements $x, x^2, x^3, \cdots, x^n$ and, for $1 \leq i, j \leq n$, any two distinct vertices x^i and x^j are adjacent if $x^i x^j = 0$ in $\mathcal{S}_M$.

In the light of above reference, our main aim in this study is to extend these studies over $\Gamma(\mathcal{S}_M)$ to a special graph product. Particularly, we will investigate some graph parameters for that product of any two monogenic semigroup graphs $\Gamma(\mathcal{S}_M^1)$ and $\Gamma(\mathcal{S}_M^2)$.

Keywords: *Graph; Graph Parameters; Monogenic Semigroup*

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Structure of codes in the group rings $\mathbb{Z}_4(C_n)$

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Abstract

Group rings provide a rich source for zero-divisors and units. Cyclic codes can be viewed as special types of zero-divisor codes of the group ring defined over cyclic groups. The notion of zero-divisor derived codes in group rings is originally proposed by in Hurley and Hurley [1]. In this work we study the algebraic structure of codes obtained from group rings $\mathbb{Z}_4(C_n)$.

Keywords: *Group rings; Cyclic codes; Zero divisors*

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Two-repeated CT burst error correcting array codes with respect to the Euclidean weight

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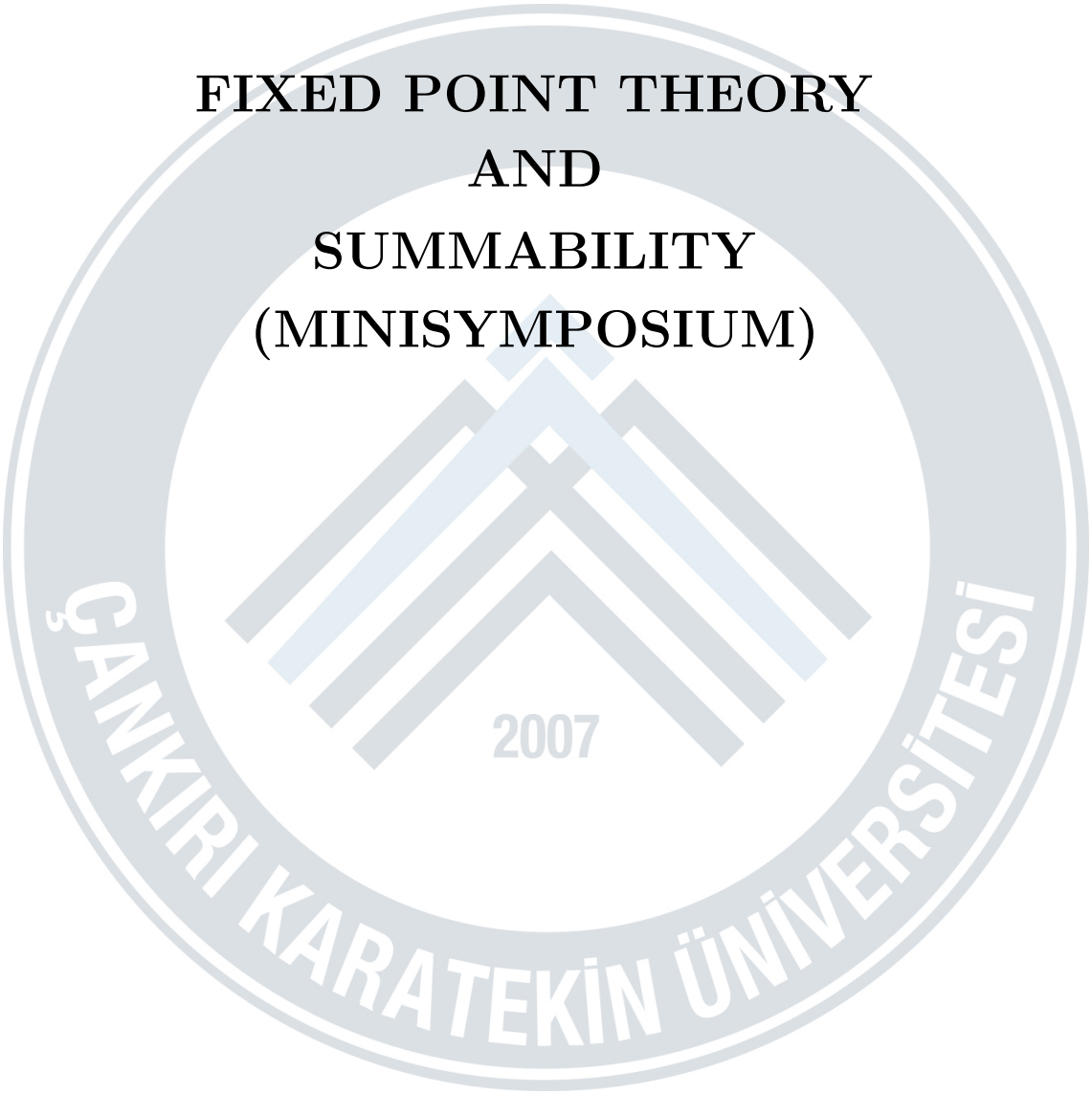
Abstract

In algebraic coding theory, for some particular transmission channels, it is very important to detect or even correct the errors which are not random but confined to some consecutive positions, called burst errors introduced first by Fire in 1959. Also in 1965, Chien and Tang introduced a novel type of burst, called CT burst. Also, there are some studies that shows the importance of detecting or correcting repeated bursts. In this paper, we give some bounds on the number of parity check bits for array codes correcting 2-repeated burst errors with respect to the Euclidean weight.

Keywords: *Burst error; Array codes; Euclidean weight*

FIXED POINT THEORY AND SUMMABILITY (MINISYMPOSIUM)



Common fixed point theorems for generalized weak contractions in BA-cone metric space

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Abstract

In this paper, some common fixed points theorems are established for four weakly compatible mappings using generalized weak contractions through rational expressions in cone metric spaces over Banach algebra. Also, our main results improve and generalize the recent literature.

Keywords: *BA-cone metric space; Common fixed points; Generalized weak contractions; Banach algebra; Rational expressions*

Logarithmic summability of integrals of Fuzzy-number-valued functions

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Abstract

In the present paper, we define the concept of Logarithmic summability of integrals of fuzzy-number-valued functions and prove a related Tauberian theorem. The paper also reveals slowly decreasing type Tauberian results.

Keywords: *Fuzzy-number-valued function; Convergence of integrals; Logarithmic summability method*

Common fixed point theorems on modular space involving a graph

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Abstract

After the appearance of Jachmyski's theorem, the field of fixed point theory applied to metric space with a graph has attracted much attention. Fixed point and common fixed point results have been presented in abstract spaces in recent times. In this paper, we establish fixed point results on a modular space involving a graph defining the notions of generalized almost (φ, G)-contraction and C_ρ-graph. Also, we prove common fixed point theorems for two self maps on a modular space with a directed graph introducing ST-connected and μ_ρ-graph. Moreover, we present examples to illustrate the usability of the our main results

Keywords: *Connected graph; Fixed point; Common fixed point; Generalized almost contraction; Modular space*

On the fine spectrum of generalized upper triangular triple-band matrices $\left(\Delta^2_{uvw}\right)^t$ over the sequence space l_1

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Abstract

In this work, we determine the fine spectrum of the matrix operator $(\Delta^2_{uvw})^t$ which is defined as generalized upper triangular triple band matrix on l_1. Also, we give the approximate point spectrum, defect spectrum and compression spectrum of the matrix operator $(\Delta^2_{uvw})^t$ on l_1.

Keywords: *Spectrum of an operator; Fine spectrum; Goldberg's classification; Approximate point spectrum; Defect spectrum; Compression spectrum*

Common fixed point theorems for generalized A-contraction in modular space

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Abstract

The purpose of this paper is to prove some common fixed point theorems for four self-maps on modular space using property of A_φ. Also, we improve, generalize and extend some fixed point results in modular space in the existing literature.

Keywords: *Common fixed point; A-contraction; Integral type contractive condition; Modular space.*

Domain of the Nörlund matrix on some Maddox's spaces

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Abstract

Maddox defined the sequence spaces $\ell_\infty(p)$, $c(p)$ and $c_0(p)$ in [1] and [2], respectively. In the present paper, following Yeşilkayagil and Başar [3], the Nörlund sequence spaces $\ell_\infty(N^t,p)$, $c(N^t,p)$ and $c_0(N^t,p)$ of non-absolute type which are the domain of the Nörlund mean with respect to the sequence $t=(t_k)$ in the Maddox's spaces $\ell_\infty(p)$, $c(p)$ and $c_0(p)$ are introduced and it is proved that those sequence spaces are linearly isomorphic to the spaces $\ell_\infty(p)$, $c(p)$ and $c_0(p)$, respectively. The alpha-, beta- and gamma-duals of the spaces $\ell_\infty(N^t,p)$, $c(N^t,p)$ and $c_0(N^t,p)$ are determined and the bases of the spaces $c(N^t,p)$ and $c_0(N^t,p)$ are given. Besides this, the classes of matrix transformations from $\ell_\infty(N^t,p)$ to ℓ_∞, f, f_0, c, c_0 and from $\lambda(p)$ to $\mu(N^t,p)$ are characterized, where λ,μ denote any of the classical sequence spaces ℓ_∞, c or c_0.

Keywords: *Paranormed sequence space; Matrix domain; alpha-, beta- and gamma-duals; Matrix transformations*

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A generalization of $\mathcal{I}$-asymptotically Lacunary statistical equivalence of sequences of sets

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Abstract

This paper presents, for sequences of sets, a generalization of the concept of $\mathcal{I}$-asymptotically lacunary statistical equivalence by using the sequence $p = (p_k)$ which is the sequence of positive real numbers where $\mathcal{I}$ is an ideal of the subset of $\mathbb{N}$.

Keywords: *Asymptotically equivalence; Statistical convergence; $\mathcal{I}$-convergence; Lacunary sequence; Cesàro summability; Sequences of sets; Wijsman convergence*

On some results of $\mathcal{I}_2$-convergence of double sequences of functions

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Abstract

In this work, we investigate some results of $\mathcal{I}_2$-convergence of double sequences of functions with values in $\mathbb{R}$ and prove a decomposition theorem.

Keywords: *Ideal; Double sequences; $\mathcal{I}$-convergence; Double sequences of functions*

On the domain of Nörlund mean in the space of almost null and almost convergent sequence spaces

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Abstract

In this article, the sequence spaces $f_0(N^t)$ and $f(N^t)$ are introduced as the domain of Nörlund mean in f_0 and f of almost null and almost convergent sequence spaces which are isomorphic to the spaces f_0 and f, respectively, and some inclusion relations are given. Additionally, their alpha-, beta- and gamma-duals are computed. Finally, some matrix classes are characterized.

Keywords: *Matrix domain; Spaces of almost null and almost convergent sequences; Nörlund matrix; alpha-, beta- and gamma-duals and matrix transformations*

A generalization of Geraghty's theorem in ordered cone metric spaced over Banach algebra and applications to ordinary differential equation

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Abstract

In the present paper, we establish fixed point theorems for generalized contraction in ordered cone metric space over a Banach Algebra. Also we give some results related to existence and uniqueness for the solution of ordinary differential equation, as an application.

Keywords: *Ordered cone metric space; Fixed point theorem; Banach algebra; Differential equation*

$\mathcal{I}$-limit superior and $\mathcal{I}$-limit inferior for sequences of fuzzy numbers

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Abstract

The statistical limit inferior and limit superior for sequences of fuzzy numbers have been introduced by Aytar, Pehlivan and Mammadov (Fuzzy Sets and Systems, 157(7) (2006) 976–985). In this paper we extend concepts of statistical limit superior and inferior to $\mathcal{I}$-limit superior and $\mathcal{I}$-inferior for a sequence of fuzzy numbers. We also prove some basic properties.

Keywords: *Fuzzy numbers; Sequences of fuzzy numbers; Ideal convergence; Ideal limit superior and inferior*

Some Tauberian remainder theorems for Hölder summability

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Abstract

In this paper, we prove some Tauberian remainder theorems that generalize the results given by Meronen and Tammeraid [10] for Hölder summability method using the notion of the general control modulo of the oscillatory behavior of nonnegative integer order.

Keywords: *Tauberian remainder theorem; λ-bounded series; General control modulo; Hölder summability*

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On the new multi-step iteration process for multi-valued mappings in a complete geodesic space

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Abstract

In this study, we prove the strong and $\triangle$-convergence theorems of the new multi-step iteration process for multi-valued quasi-nonexpansive mappings in a complete geodesic space. Our results extend and improve some results in the literature.

Keywords: *Fixed point; Multi-valued mapping; Strong convergence; $\triangle$-convergence; Geodesic space*

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On minimal non-hypercentral-groups

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Abstract

Let X be a class of groups. A group is said to be minimal non-X if it is not an X-group, while all its proper subgroups belong to X. In this note we prove that a minimal non-hypercentral group a finitely generated is a perfect group which has no proper subgroup of finite index and such that G/Frat(G) is an infinite simple group, where Frat(G) stands for Frattini subgroup of G.

Keywords: *Nilpotent groups; Hypercentral groups; Locally nilpotent groups; Frattini subgroups*

On some new generalized difference sequence spaces derived by using factorable matrix

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Abstract

In this study, we define a new triangle matrix $\widehat{G} = \{g_{nk}^{u,v}(r,s,t)\}$ which is derived by using multiplication of weighted mean matrix $G = (g_{nk})$ with triple band matrix $B(r,s,t)$. Also, we introduce the sequence spaces $c_0^{u,v}(\widehat{G}), c^{u,v}(\widehat{G}), \ell_\infty^{u,v}(\widehat{G})$ and $\ell_p^{u,v}(\widehat{G})$ by using matrix domain of the matrix $\widehat{G}$ on the classical sequence spaces c_0, c, ℓ_∞ and ℓ_p , respectively, where $1 \leq p < \infty$. Moreover, we show that the space $\mu^{u,v}(\widehat{G})$ is norm isomorphic to μ for $\mu \in \{c_0, c, \ell_\infty, \ell_p\}$. Furthermore, we compute $\alpha-, \beta-\gamma-$ duals of those spaces and construct their Schauder bases. Finally, we characterize the classes $(\mu_1^{u,v}(\widehat{G}) : \mu_2)$ of infinite matrices , where $\mu_1 \in \{c, c_0, \ell_p\}$ and $\mu_2 \in \{\ell_\infty, c, c_0, \ell_p\}$.

Keywords: *Matrix domain of a triangle matrix; Matrix transformations ; Schauder basis; $\alpha-, \beta-$ and $\gamma-$ duals*

On some new difference sequence spaces

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Abstract

In this paper, we introduce the sequence spaces $c_0(T)$ and $c(T)$ by using the matrix $T = (t_{nk})$ defined by

$$t_{nk} = \begin{cases} t_n & , \quad k = n \\ -\frac{1}{t_n} & , \quad k = n-1 \\ 0 & , \quad k > n \text{ or } 0 \leq k < n-1 \end{cases}$$

for all $n, k \in \mathbb{N}$,where $t_n > 0$ for all $n \in \mathbb{N}$ and $(t_n) \in c \backslash c_0$. Also, we give some inclusion theorems related to these spaces and find the α-, β-, γ- duals. Lastly, we characterize some matrix classes on the spaces $c_0(T)$ and $c(T)$.

Keywords: *Sequence spaces; Matrix transformations; Schauder basis; α-, β-, γ- duals.*

An application of the measure of noncompactness to some nonlinear functional integral equations in space $C[0, a]$

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Abstract

The main purpose of this paper is to study the existence of solutions of some nonlinear functional integral equations in the space of continuous functions on interval $[0, a]$ under some conditions. To do this, we will use Darbo's fixed point theorem associated with the measure of noncompactness. We will give also some examples and a remark to show the relation between our main result and previous result in [1].

Keywords: *Nonlinear integral equations; Measure of noncompactness; Darbo's fixed point theorem*

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Weakly T_F type contractive mappings

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Abstract

In this paper, the concept of weakly T_F-contractive conditions are considered for the Banach, Kannan and Chatterjea fixed point theorems. It is shown that these mappings have a unique fixed point in a complete metric space.

Keywords: *Fixed point; Chatterjea type contractive; Kannan fixed point theorem; Contraction mappings*

p-summable sequence spaces with 2-inner products

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Abstract

We revisit the space l^p of p-summable sequences of real numbers. In particular, we show that this space is actually contained in a (weighted) 2-inner product space. For $p > 2$, we also obtain a result which describe how the weighted 2-inner product space is associated to the weights.

Keywords: 2-*inner product spaces;* 2-*normed spaces; p-summable sequences; Weights*

On some matrix transformations and their Hausdorff measure of noncompactness

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Abstract

We consider certain sequence spaces, and give the characterizations of the classes of matrix transformations. We also establish some estimates for the norms of bounded linear operators defined by those matrix transformations. Moreover, the Hausdorff measure of noncompactness is applied to give necessary and sufficient conditions for a linear operator on the studied sets and to be compact.

Keywords: *Bounded linear operators; Compactness; Matrix mappings*

On Wijsman ideal convergent set sequences defined by an Orlicz function

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Abstract

The concept of convergence of sequences of numbers has been extended by several authors to convergence of sequences of sets. The one of these such extensions considered in this paper is the concept of Wijsman convergence. In this study we introduce some new classes of sequences of sets. For these new classes, we use the ideal of the subset of positive integers $\mathbb{N}$ and an Orlicz function.

Keywords: *I-convergence; Set sequences; Wijsman convergence; Orlicz function*

Hybrit iteration method for fixed points of nonself nonexpansive mapping in Banach spaces

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Abstract

In this paper, a hybrid iteration method is studied and the strong convergence of the iteration scheme to a fixed point of nonself nonexpansive mapping is obtained in Banach Spaces.

Keywords: *Nonself nonexpansive mapping; Fixed point; Hybrid iteration scheme*

Recent developments on fixed point theory for multivalued mappings

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Abstract

In the study, by analysing the recent technique of Wardowski for fixed points of single-valued mappings on complete metric space, we give some new fixed point results for multivalued mappings. We also provide some examples to both illustrate and show that our results are real generalization of well known Nadler and Mizoguchi-Takahashi theorems in the literature.

Keywords: *Fixed point; Complete metric space; Multivalued mapping; Contraction mapping*

On the fine spectra of a new matrix operator over the sequence space ℓ_1

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Abstract

In this study, our purpose is to determine the point spectrum, the continuous spectrum, and the residual spectrum of matrix T, which is multiplication of weighted mean matrix and generalized difference matrix of order m, on sequence space ℓ_1.The matrix is defined by

$$T = (t_{nk}) = G(u,v).B^m(r,s) = \begin{cases} u_n \sum_{j=k}^{n} \binom{m}{j-k} r^{m-j+k} s^{j-k} v_j, & 0 \leq k \leq n \\ 0, & k > n \end{cases}$$

$\forall r, s \epsilon \mathbb{R} - \{0\}$ and for all $k, n \epsilon \mathbb{N}$ where (u_n) depends only on n and (v_k) only on k, $u_n \neq 0$, $v_k \neq 0$.

Keywords: *Fine spectra; Spectrum of an operator; Weighted mean matrix; Generalized difference matrix of order m; Sequence space*

Some fixed point conclusions in probabilistic metric spaces

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Abstract

In this study, we define weak contraction on probabilistic metric spaces. We show that the set of fixed point is different from null set. Also we obtain some convergence conclusions for approximating fixed points by means of Picard iteration.

Keywords: *Probabilistic metric spaces; Weak contraction; Fixed point*

On the convergence results for a new iteration method under generalized multivalued nonexpansive mappings in Banach spaces

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Abstract

In this presentation, we obtain some convergence results of a new iteration for generalized multivalued mappings in Banach spaces under different conditions. The sequences of a new fixed point process iterates to a fixed point of generalized multivalued nonexpansive mappings faster than recently introduced iterative fixed point process for multivalued mappings in Banach spaces.

Keywords: *Iteration methods; Convergence analysis; Multivalued mappings*

On different results for a new two-step iteration method under weak contraction mappings in Banach spaces

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Abstract

In this paper, we show that a new two-step iteration method converges faster than Picard-Mann hybrid iterative scheme defined in [Khan, SH: A Picard-Mann hybrid iterative process. Fixed Point Theory Appl. 2013, Article ID 69 (2013), doi:10.1186/1687-1812-2013-69.]. Also we prove that this iteration method can be used solving delay differential equations and we give a stability result for weak contraction mappings by using this iteration method.

Keywords: *Iteration methods; Rate of convergence; stability; Weak contraction mappings*

On the spectrum of a new operator on certain sequence space

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Abstract

In functional analysis, the spectrum of an operator generalizes the notion of eigenvalues for matrices. The spectrum of an operator over a Banach space is partitioned into three parts, which are the point spectrum, the continuous spectrum and the residual spectrum. In this paper we obtained the spectra for W matrix, which is multiplication of factorable matrix and difference matrix, on sequence space ℓ_1.The matrix is defined by

$$W = (w_{nk}) = \begin{cases} u_n v_n, & n = k \\ u_n \left(v_k - v_{k+1}\right), & 0 \leq k < n \\ 0, & n < k \end{cases}$$

where the sequences $u = (u_n)$ and $v = (v_k)$ are constant or strictly decreasing or strictly increasing sequence of positive real numbers satisfying certain conditions.

Keywords: *Spectrum of an operator; Sequence space; Matrix transformation*

Existence of tripled fixed points for a class of condensing operators in Banach spaces

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Abstract

In this paper, we give some results concerning the existence of tripled fixed points for a class of condensing operators in Banach spaces. In further, as an application, we study the existence of solutions for a general system of non linear integral equations.

Keywords: *Measure of noncompactness; Modulus of continuity; Tripled fixed point; System of integral equations*

On DPM iteration method for weak contraction mappings in Banach spaces

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Abstract

In this paper, we introduce a new iteration method which we call "Double Picard-Mann (DPM) iteration process" by inspired Picard-Mann hybrid iterative scheme defined in [1] and we show that this iteration method can be used to approximate fixed point of weak contraction mappings. Furthermore, we prove that DPM iteration method is equivalent to Mann iterative scheme and converges faster than Ishikawa iterative scheme for the class of weak contraction mappings. Finally, we prove a data dependence result for weak contraction mappings by using DPM iterative scheme.

Keywords: *DPM iteration methods; Strong convergence; Data dependence; Weak contraction mappings*

References

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On some results of MP iteration procedure for weak contraction operator in Banach spaces

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Abstract

Let C be a nonempty convex subset of a Banach space B and T be a self map of C.

In this presentation, we introduce in the following a new iteration procedure called MP.

Assume that $\{\varphi_n\} \subset [0,1]$, then $\{x_n\} \subset C$ is a sequence including the operator T, as follows:

$$\begin{cases} x_0 \in C \\ x_{n+1} = (1-\varphi_n)\, y_n + \varphi_n T y_n \\ y_n = T x_n \end{cases}$$

Taking T as a weak contraction mapping, we obtain the strong convergence and data dependence results for this iteration procedure in the Banach spaces. Moreover, we show that its convergence is equivalent to convergence of some others iteration procedures. Also, we have shown with the help of a computer application and an example that MP iteration procedure is faster than well known iteration procedures in the literature.

Keywords: *MP iteration procedure; Weak contraction procedure; Strong convergenge; Data dependence; Rate of convergence and equivalence of convergence*

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A Picard-S hybrid type iteration method for solving a differential equation with retarded argument

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Abstract

We introduce a new iteration method called Picard-S iteration. We show that the Picard-S iteration method can be used to approximate the fixed point of contraction mappings. Also, we show that our new iteration method is equivalent and converges faster than CR iteration method for the aforementioned class of mappings. Furthermore, by providing an example, it is shown that the Picard-S iteration method converges faster than all Picard, Mann, Ishikawa, Noor, SP, CR, S and some other iteration methods in the existing literature. A data dependence result is proven for fixed point of contraction mappings with the help of the new iteration method. Finally, we show that the Picard-S iteration method can be used to solve differential equations with retarded argument.

Keywords: *Picard-S iteration method; Rate of convergence; Data dependence of fixed points; Contraction mappings; Differential equations with retarded argument*

Some remarks on l^p as an n-normed space

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Abstract

Similar to the 2-normed spaces, we can also give two definitions of Cauchy sequence for n-normed space. We know that in some cases, like finite dimensional case and the standard case the two definitions are equivalent. What is not clear is in the infinite dimensional case. In this presentation, we will proof that this two definitions are still equivalent in l^p spaces.

Keywords: *Cauchy sequence; Convergence; The space of p-summable sequences; Equivalence*

Fixed point results for modified $\alpha - \psi$-contractive mappings

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Abstract

In the study, by examining the concept of $\alpha-$admissible maps by Salimi on metric space, we give not only extend the results of Salimi but also generalize them. Then, we give some examples to show our results are proper extensions. Furthermore, we use our results to obtain the existence and uniqueness result for a solution of fourth order two point boundary value problem.

Keywords: *Fixed point; Complete metric space; $\alpha-$admissible maps*

A partial solution to an open problem

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Abstract

Let $(X, \|.,...,.\|)$ be a real n-normed space, as introduced by *S. Gähler* [1] in 1969. The set X' of all bounded multilinear n-functionals on $(X, \|.,...,.\|)$ forms a vector space. A bounded multilinear n-functional F is defined by $\|F\| := \sup\{|F(x_1,...,x_n)| : \|x_1,...,x_n\| \leq 1\}$. This formula defines a norm on X'. Let $Y := \{y_1,...,y_n\}$ in $l^{p'}$, where p' is the dual exponent of p. *Batkunde et al.* [2] defined the following multilinear n-functional on l^p where $1 \leq p < \infty$:

$$F_Y(x_1,...,x_n) := \frac{1}{n!}\sum_{j_1}...\sum_{j_n}\begin{vmatrix} x_{1j_1} & \cdots & x_{1j_n} \\ \vdots & \ddots & \vdots \\ x_{nj_1} & \cdots & x_{nj_n} \end{vmatrix}\begin{vmatrix} y_{1j_1} & \cdots & y_{1j_n} \\ \vdots & \ddots & \vdots \\ y_{nj_1} & \cdots & y_{nj_n} \end{vmatrix}$$

for $x_1,...,x_n \in l^p$. Regarding the n-functional F_Y on $\left(l^p, \|.,...,.\|_p\right)$, an open problem was given in [2]. They want to compute the exact norm of F_Y, especially for $p \neq 2$. In this talk, we deal with a partial solution to this open problem given in their paper.

Keywords: *Bounded multilinear n-functional; Space of p-summable sequences; n-norm*

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Fixed point theorem for Ćiric type almost contraction

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Abstract

In the study, we prove a fixed point theorem using (c)-comparison function, then prove Boyd and Wong type fixed point theorem.

Keywords: *Fixed point; Partial metric space; Almost contraction*

On Mann iteration process derived by weighted mean and its fixed point

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Abstract

In this work, we introduce the Mann iteration process derived by weighted mean and investigate its fixed point.

Keywords: *Fixed point; Weighted mean; Mann iterations*

On fine spectra and subspectrum of operator with periodic coefficients

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Abstract

The main purpose of this paper is to determine the fine spectra of the difference operator with periodic coefficients over the sequence spaces c_0 and c.

Keywords: *Fine spectra; Difference operator; Infinite matrices; Sequence spaces*

On the solutions of a class of some nonlinear integral equations in the Banach algebra of the continuous functions and some examples

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Abstract

In this paper, we study the existence of the solutions of a class of functional integral equations which contain a number of classical nonlinear integral equations as special cases. We consider the solvability of the equations in the Banach algebra of continuous functions on a closed bounded interval. The main tools here are the measure of noncompactness and the suitable fixed point theorem for the product of two operators in the Banach algebra.

Keywords: *Nonlinear integral equation; Measure of noncompactness; Fixed point theorem; Banach algebra; Product of two operators*

Domain of four dimensional Riesz mean in some double sequence spaces

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Abstract

By ω and Ω, we denote the sets of all real valued single and double sequences which are the vector spaces with coordinatewise addition and scalar multiplication. Any vector subspaces of ω and Ω are called as the *single sequence space* and *double sequence space*, respectively. By $\mathcal{M}_u$, $\mathcal{C}_p$, $\mathcal{C}_{0p}$, $\mathcal{C}_{bp}$, $\mathcal{C}_r$ and $\mathcal{L}_q$ we denote the spaces consisting of all bounded, convergent in the Pringsheim's sense, null in the Pringsheim's sense, both convergent in the Pringsheim's sense and bounded, regularly convergent and q-summable double sequences, respectively. Let λ be any space of single or double sequences and A also be a two or four dimensional infinite matrix. The *domain* λ_A of A in the space λ is defined by $\lambda_A = \{x = (x_k) : Ax \in \lambda\}$ which is a sequence space. If A is triangle, then one can easily see that the sequence spaces λ_A and λ are linearly isomorphic, i.e., $\lambda_A \cong \lambda$. In spite of the domain of certain triangle matrices in the normed or paranormed spaces of single sequences are studied by several researchers (see [2, Chapter 4]). The corresponding problems remain open for the four dimensional matrices and the spaces of double sequences. As a natural continuation of Altay and Başar [1] and Mursaleen and Başar [3] in [4], we have investigated the domain of Riesz mean R^{qt} in the spaces $\mathcal{M}_u$, $\mathcal{C}_p$, $\mathcal{C}_{bp}$ and $\mathcal{C}_r$ of double sequences. In the special case $q = t = e = (1, 1, 1, \ldots)$, since the Riesz mean R^{qt} is reduced to the four dimensional Cesàro mean C of order one, our results are much more general and comprehensive than the corresponding results of Mursaleen and Başar [3].

Keywords: *Double sequence space; Four dimensional Riesz mean; alpha-, beta-duals and matrix transformations.*

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A new approach to multivalued almost contraction on complete metric spaces

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Abstract

Wardowski [Fixed Point Theory Appl., 2012:94] introduced a new concept of contraction and proved a fixed point theorem which generalizes Banach contraction principle. Following, this direction of research, Altun et al. [Journal of Nonlinear and Convex Analysis, In press.] introduced the concept of multivalued F-contractions and obtained some fixed point results for these type mappings on complete metric spaces. In this talk, we will present some fixed point results for multivalued mappings which satisfy an F-contractive condition of multivalued almost type on complete metric spaces. Also, we give some illustrative examples showing that our results are proper generalizations of some previous results.

Keywords: *Fixed point; Almost F-contraction; Multivalued mapping; Multivalued almost contraction*

POSITIVE OPERATORS AND THEIR RELATED APPLICATIONS (MINISYMPOSIUM)

Finite difference method for fractional parabolic differential equations

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Abstract

We consider initial-boundary value problems for fractional parabolic differential equations. Finite difference method and operator approach are applied to construct the first and second orders of accuracy stable difference schemes for these problems. We obtain stability, coercive stability and almost coercive stability estimates for the solutions of these difference schemes. Numerical examples and error analysis for the approximate solutions of them are given.

Keywords: *Finite difference method; Fractional parabolic equations; Difference schemes; Stability estimate*

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Spectral stability analysis of a new difference scheme of time fractional advection dispersion equations

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Abstract

In this paper, a new difference scheme is constructed based on Crank Nicholson difference scheme. It can be used for solving time-fractional advection dispersion equations involving Caputo fractional derivative. We prove that the proposed method is unconditionally stable by using spectral stability technique. Numerical experiments are presented.

Keywords: *Time-fractional advection dispersion equations; Crank-Nicholson difference schemes; Spectral stability*

The solution of a singularly perturbed Cauchy problem using a method of a deviating argument

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Abstract

This paper proposes a principally new method to investigate singularly perturbed Cauchy problem, based on the spectral theory of equations with deviating argument. In this paper using the method of deviating argument, we get asymptotic decomposition of solutions of the Cauchy problem for the ordinary differential equations of the n-th order with variable coefficients. The essence of the method consists in the following: solution of the problem is decomposed into Fourier series on the eigenfunctions of the corresponding boundary value problem. Then the coefficients of this series are converted using integration by parts. As a result of these transformations, we get a new (recurrent) representation of the solution of the original problem. Then using the method of mathematical induction one can obtain an asymptotic expansion of the solution of specified tasks. The remainder of the obtained expansion is estimated by means of a priori estimates. By means of the direct computation one shows the generality of the obtained recursion formula and removed additional conditions that emerged in the course of the research. If the right part of equation of the considered task is a non-smooth function, our method has some advantages in comparison with the method of the successive approximations. This moment plays a significant role in the practical implementation of this method in the specific situations.

Keywords: *Spectrum; Spectral decomposition; Deviating argument; Singular perturbation*

On the stability of a source identification problem

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Abstract

In this study, the following time-dependent source identification problem with an integral condition

$$\begin{cases} \frac{\partial u(t,x)}{\partial t} - \frac{\partial}{\partial x}\left(a\left(x\right)\frac{\partial u(t,x)}{\partial x}\right) + \sigma u\left(t,x\right) = p\left(t\right)q\left(x\right) \\ +f\left(t,x\right), 0 < x < L, 0 < t \leq T, \\ u\left(0,x\right) = \varphi\left(x\right), 0 \leq x \leq L, \\ u_x\left(t,0\right) = u\left(t,L\right) = 0, 0 \leq t \leq T, \\ \int_0^L u\left(t,x\right)dx = \psi\left(t\right), 0 \leq t \leq T \end{cases}$$

is investigated. Here, $u\left(t,x\right)$ and $p\left(t\right)$ are unknown functions, $a(x)$, $f(t,x)$, $\psi\left(t\right)$ and $\varphi(x)$ are given sufficiently smooth functions and $a(x) \geq a > 0$. Also, $q\left(x\right)$ is a sufficiently smooth function with assuming that $q'\left(0\right) = q\left(L\right) = 0$ and $\int_0^L q\left(x\right)dx \neq 0$. The stability estimates for the solution of this problem in $C\left(\left[0,T\right],L_2\left[0,L\right]\right)$ spaces are established. The almost coercive stability estimates for the solution of difference schemes in the difference analogy of $C\left(\left[0,T\right],L_2\left[0,L\right]\right)$ spaces are obtained.

Keywords: *Finite difference method; Source identification problem; Stability*

On the sum and product of closed operators and their spectra

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Abstract

Let H be a complex Hilbert space. Throughout this talk all operators are assumed to be densely defined together with any operations involving them or their adjoints. In first time and concerning the sum and the product of linear closed operators a natural question that may arise is to find sufficient conditions under different perturbations to ensure closedness of the sum and product and fix the adjoint relation problem. The results known in bounded case are not true anymore, that means if A and B are two linear closed operators with densely domains $D(A)$ and $D(B)$ respectively, $A + B$ may just have not any sense or need not to be closed. Our talk is concentrated about those questions and we may present our contributions shortly. Beside this study, we present a short survey on spectrum of sum and product of closed linear operators and some properties of their adjoints.

Keywords: *Sum and product of linear closed operators; Self adjoint operators; Metric of the gap; Spectra of the sum and product of linear closed operators*

Eigenvalue problems on surfaces

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Abstract

On a surface S we study the direct and inverse problem of eigenvalues for the Laplacian and Schrödinger operator. This study is based on relation between the first eigenvalue and geometrical quantities of the surface.

Keywords: *Laplacian; Schrödinger operator; Riemannian manifold; Curvature*

Higher 3.0-order semi-implicit Taylor schemes for Itô stochastic differential equations

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Abstract

The paper considers the derivation of families of semi-implicit schemes of weak order N = 3.0 (general case) for the numerical solution of Itô stochastic differential equations. The degree of implicitness of the schemes depends on the selection of N parameters which vary between 0 and 1 and the families contain as particular cases the 3.0 explicit scheme. Since the implementation of the multiple integrals that appear in these theoretical schemes is difficult, for the applications they are replaced by simpler random variables. In this way, for the multidimensional case with one-dimensional noise, we give an infinite family of semi-implicit simplified schemes of weak order 3.0 and for the multidimensional case with additive one-dimensional noise. The mean-square stability of the 3.0 family is analyzed, concluding that, as in the deterministic case, the stability behavior improves when the degree of implicitness grows. Numerical experiments confirming the theoretical results are shown.

Keywords: *Stochastic Taylor formula; Stiff stochastic differential equations; Weak numerical schemes; Semi-implicit schemes; Mean-square stability*

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On some spectral properties of a boundary-transmission problem

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Abstract

The aim of this study is the investigation of a nonstandard Sturm-Liouville problem on two disjoint intervals together with supplementary so-called transmission conditions. We found sufficient conditions on the coefficients of the considered problem under which the basic spectral properties of our problem are similar those of the standard Sturm-Liouville problems. Moreover, we examine asymptotic behaviour of the eigenvalues and corresponding eigenfunctions.

Keywords: *Nonstandard Sturm-Liouville problems; Eigenvalue; Eigenfunction*

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Numerical solution of parabolic-Schrödinger equations with nonlocal boundary condition

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Abstract

In the study, a numerical method is proposed for solving parabolic-Schrödinger partial differential equations with nonlocal boundary conditions. The first and second orders of accuracy difference schemes are presented. The method is illustrated by numerical examples.

Keywords: *Partial differential equation; Difference scheme; Nonlocal boundary condition*

On Cauchy problem for the general hyperbolic equation

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Abstract

The Cauchy problem for hyperbolic equations has been investigated extensively by many researchers (see, e.g., [1]- [6] and the references given therein). In particular, the Cauchy problem in a bar $[0, T]$ has been studied in [1]. In the present paper, the Cauchy problem for the general second order multidimensional hyperbolic equation is studied in the bar $[-T, T]$. The unique solvability of the problem is proved in Sobolev spaces. In contrast to [1], conditions on the coefficients of the equation are weakened. Moreover, the existence of a generalized solution of the Cauchy problem is established applying a new functional approach of papers [2]- [3].

Keywords: *Hyperbolic equation; Cauchy problem; Sobolev spaces; Generalized solvability; Riesz-Fischer theorem; Isomorphism*

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On a boundary value problem of nonlinear fractional differential equation on the half line

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Abstract

This talk concerns the existence of unbounded positive solutions of a fractional boundary value problem on the half line. By means of some fixed point theorems, we prove the existence of solution.

Keywords: *Unbounded solution; Existence of solution; Leray-Schauder nonlinear alternative*

Jessen's inequality and exponential convexity for positive semigroups of operators on Banach lattice algebra

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Abstract

A classical theory of fundamental inequalities and positive definiteness for real valued functions is presented so far. In the present note, a Jessen inequality for strongly continuous positive semigroups of operators on a Banach lattice algebra is proved. It is followed by the results regarding positivity and exponential convexity of complex structures involving operators from the subject semigroup.

Keywords: *Positive semigroups on Banach lattices; Exponential convexity; Positive operators; Banach lattice algebra*

Results in the theory of delay parabolic equations

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Abstract

The theory of stability of delay partial differential and difference equations with unbounded operators acting on delay terms has been investigated in [1]-[4]. In the present paper, the stability of the initial value problem for the delay differential equation

$$\frac{dv(t)}{dt} + Av(t) = B(t)v(t-\omega) + f(t), t \geq 0; v(t) = g(t)(-\omega \leq t \leq 0)$$

in an arbitrary Banach space E with the unbounded linear operators A and $B(t)$ in E with dense domains $D(A) \subseteq D(B(t))$ is studied. Theorems on stability estimates for the solution of this problem in fractional spaces E_α are established. In practice, the stability estimates in Hölder norms for the solutions of the mixed problems for delay parabolic equations with Neumann condition with respect to space variables are obtained. Note that this work is a result of TUBAP project joint with Prof. A. Ashyralyev, Fatih University, İstanbul, Turkey.

Keywords: *Delay parabolic equations; Stability estimates; Fractional spaces; Hölder norms*

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A survey of results in the theory of fractional spaces generated by positive operators

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Abstract

The role played by positivity property of differential and difference operators in Hilbert and Banach spaces in the study of various properties of boundary value problems for partial differential equations, of stability of difference schemes for partial differential equations, and of summation Fourier series is well-known (see, [1]-[3]). This is a review paper on results for fractional spaces generated by positive operators. Its scope ranges from theory of differential and difference operators in a space to operators with local and nonlocal boundary conditions. We also discuss their applications to partial differential equations and theory of difference schemes for partial differential equations.

Keywords: *Fractional spaces; Positive operators; Differential and difference operators; Banach spaces; Interpolation spaces; Stability.*

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On the numerical solution of a telegraph equation

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Abstract

The finite difference method is important tool for the solution of telegraph equation (see, [1]-[3]). In this study, the following problem for a telegraph equation

$$\begin{cases} \frac{\partial^2 u(t,x)}{\partial t^2} + \alpha \frac{\partial u(t,x)}{\partial t} - a(x) \frac{\partial^2 u(t,x)}{\partial x^2} + \beta(x) u(t,x) = f(t,x), \\ 0 < t < T, 0 < x < L, \\ u(0,x) = \varphi(x), \frac{\partial}{\partial t} u(0,x) = \psi(x), 0 \le x \le L, \\ u(t,0) = u(t,L) = 0, 0 \le t \le T \end{cases}$$

is investigated. For the approximate solution of this problem unconditionally absolutely stable first and second order of accuracy difference schemes are presented. The obtained results are discussed by comparing with other existing numerical solutions.

Keywords: *Finite difference method; Telegraph equation; Numerical solution*

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Numerical solution of source identification problems in the heat equation

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Abstract

In this talk, numerical implementation of time and space dependent source identification problems are considered. Theoretical statements are presented and supported by numerical experiments.

Keywords: *Finite difference method; Source identification problem; Stability*

Numerical solution of elliptic-Schrödinger equations with nonlocal boundary condition

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Abstract

The nonlocal boundary value problem for a elliptic-Schrödinger equations in Hilbert space is considered. The stability estimate for the solution of the given problem is obtained. The first and second orders of difference schemes approximately solving this nonlocal boundary value problem are presented. The theoretical statements for the solution of these difference schemes are supported by the result of numerical experiments.

Keywords: *Elliptic-Schrödinger equation; Difference scheme; Nonlocal boundary condition*

Initial boundary value problem for a fractional Schrödinger differential equation

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Abstract

In the present study, fractional Schrödinger differential equations are investigated. A literature survey on the recent developments in the field of fractional Schrödinger differential equations are discussed. Some new results on fractional Schrödinger differential equations and their difference schemes are presented.

Keywords: *Fractional derivative; Fractional Schrödinger differential equation; Finite difference method; Hilbert space*

Initial value problem for 2D quasicrystals in inhomogeneous media

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Abstract

In this paper, an analytical method for solving the three-dimensional initial value problem for 2D quasicrystals in inhomogeneous media is considered. The problem is written in terms of Fourier images with respect to lateral space variables. Then the resulting problem is reduced to an equivalent second kind vector integral equation of the Volterra type. After that the solution of operator integral equation is obtained by the method of successive approximations, from which the solution of the original initial value problem can be found by the inverse Fourier transform.

Keywords: *2D quasicrystals; Fourier transform; Integral equation*

High order of accuracy difference schemes for Bitsadze-Samarskii problems

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Abstract

The Bitsadze-Samarskii nonlocal boundary value problem for the elliptic differential equation in a Hilbert space H with the self-adjoint positive definite operator A is considered. The well-posedness of this problem in Hölder spaces without a weight is established. The coercivity inequalities for solutions of the nonlocal boundary value problem for the elliptic equation are obtained. The first, second, third and fourth orders of accuracy difference schemes for the approximate solutions of this nonlocal boundary value problem are presented. The stability estimates, coercivity and almost coercivity inequalites for the solutions of these difference schemes are established. The Matlab implementations of these difference schemes for the elliptic equation are presented. The theoretical statements for the solutions of these difference schemes are supported by the results of numerical examples.

Keywords: *Bitsadze-Samarskii problem; Elliptic equation; Difference schemes; Stability*

GENERAL SYMPOSIUM

Reduction algorithm analysis for finite matrix groups

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Abstract

Setting up reduction algorithms is an important tool for understanding the structural properties of groups. There are some reduction algorithms for finite matrix groups defined over finite fields but the analysis of the algorithm designed for C_6 groups in Aschbacher classification has not yet been completed. We will discuss some of the analysis of this reduction algorithm.

Keywords: *Matrix groups; Reduction algorithms; Algorithm analysis*

A comparison between the concepts of limit, rough limit and soft limit

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Abstract

In this study, we give basic definitions of the concepts of limit, rough limit and soft limit. Then, we compare these concepts with the new definition which has differentness, practicability and a new approximation. We finally illustrate these concepts.

Keywords: *Limit; Soft limit; Rough limit*

Stochastic differential delay equations (SDDEs) and applications

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Abstract

In recent years an increasing interest in modelling real-life problems attracts the investigation of stochastic differential delay equations (SDDEs). The mathematical formulation of SDDEs incorporates not only the idea of stochasticity but also the dependence of the state variable on the past states of the system under consideration. Two of the major research questions in the area of SDDEs are linked with the existence and uniqueness of the solution of the pertinent SDDE and the qualitative behaviour of the solution, as well.
Motivated by the two afore-mentioned questions, we are going to present:
a) tests for a wide class of non-linear SDDEs to have non-explosion solutions and
b) some moment and almost sure asymptotic estimations in order to identify their qualitative behaviour.
Finally, we will discuss how the theoretical results could be applied and extended in real-life problems such as problems arising from the area of the population dynamics.

Keywords: *Stochastic differential delay equations; Applications; Population dynamics*

Merging coset diagrams of the action of modular group on $\mathbb{Q}(\sqrt{n})^*$ in $PL(F_p)$

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Abstract

Action of $PSL(2,Z)$ on a real quadratic irrational field, $\mathbb{Q}(\sqrt{n})^* = \mathbb{Q}(\sqrt{n}) \cup \{\infty\}$ is intransitive. A coset diagram for each orbit of the action contains a unique single closed path. These closed paths get merged due to the ring homomorphism from, $PSL(2,Z)$ space $\mathbb{Q}(\sqrt{n})^*$ to the $PSL(2,Z)$ space $PL(F_p) = F_p \cup \{\infty\}$, in the coset diagram for the action of $PSL(2,Z)$ on $PL(F_p)$. In this talk we explain how systematically these closed paths merge together. This explanation then makes it possible to understand why it is important to find conditions for the existence of the fragments, that is, the amalgamated closed paths in the coset diagrams for the action of $PSL(2,Z)$ on $PL(F_p)$. In the end we interpret this important phenomenon through adjacency matrices giving new insights.

Application of the homotopy perturbation method for solving delay HIV infection model of CD4$^+$ T cells

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Abstract

In this paper, we consider a system of three delay differential equations on the infection of CD4$^+$ T cells by Human Immunodeficiency Virus (HIV). We apply the Homotopy Perturbation Method to the model and obtain its approximate solutions in the form of third degree polynomials.

Keywords: *System of delay differential equations; HIV infection model of CD4$^+$ T cells; Homotopy perturbation method*

Curves of constant slope and curves of constant precession in contact 3-manifolds

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Abstract

In the study, firstly we give some differential equations for a curve of constant slope whose tangent vector field makes a constant contact angle with the Reeb vector field ξ in 3-dimensional Sasakian manifolds. Then we define a new kind of curve called N-slant helix whose principal normal vector field makes a constant contact angle with the Reeb vector field ξ. Morever, we obtain that a curve of constant precession is a N-slant helix in contact 3-manifolds.

Keywords: *Slant helices; Curve of constant precession; Sasakian manifold*

Geometry of similar surfaces in E^3

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Abstract

In this study, we investigate images of constant angle surfaces up to direct similarity transformation. Moreover, this idea is considered for linear Weingarten surfaces and their parallel surfaces. Then, the types of linear Weingarten surfaces and image of its parallel surfaces up to direct similarity transformation are classified in terms of r which is a distance between linear Weingarten surfaces and its parallel surfaces.

Keywords: *Similarity transformations; Similar surfaces; Linear Weingarten surfaces; Constant angle surfaces*

A new approach to tubular surfaces in Euclidean 3-Space

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Abstract

A tubular surface is defined as envelope of a nonparameter set of spheres, centered at a spine curve with constant radius. The paper is devoted to tubular surface which is determined by spherical indicatrices of any spatial curve. Furthermore, some illustrative examples of the tubular surfaces and their new approaches are given.

Keywords: *Tubular surface; Spherical indicatrices; Gauss curvature; Mean curvature*

Complete and horizontal lifts of silver structure in the tangent bundle

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Abstract

In this study, we studied complete and horizontal lifts of silver structure in the tangent bundle. Further, we obtained integrability conditions of silver structure in the tangent bundle.

Keywords: *Silver structure; Prolongations; Complete lift; Tangent bundle; Integrability*

Exact solutions of the nonlinear evolution equations by auxiliary equation method

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Abstract

In this paper, we establish the travelling wave solutions of nonlinear Zoomeron equation and coupled Higgs equations. The auxiliary equation method presents a wide applicability to handling nonlinear evolution equations. This method could be used in further works to establish more entirely new solutions for other kinds of nonlinear evolution equations arising in applied mathematics and physics.

Keywords: *Exact solutions; Symbolic computation; Zoomeron equation; Coupled Higgs equation*

Some properties associated with the incomplete q-gamma function

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Abstract

The q-analogue of the incomplete gamma function is defined for $\alpha > 0$, $x > 0$ and $0 < q < 1$ by

$$\gamma_q(\alpha, x) = \int_0^x t^{\alpha-1} E_q^{-qt} d_q t.$$

In this study, we give some generalized equalities of the incomplete q-gamma function for all values of x via the theory of neutrices.

Keywords: *Incomplete q-gamma function; Neutrix; Neutrix limit*

Weighted $I-$statistical convergence and its application to Korovkin type approximation theorem

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Abstract

In this paper, we introduce the concepts of weighted ideal statistical convergence (or $S_{\bar{N}}(I)-$ convergence) and $I-\left(\bar{N},p_n\right)-$ summability. We also establish the relations between our new methods. Further, we determine a Korovkin type approximation theorem through $I-\left(\bar{N},p_n\right)-$ summability.

Keywords: *Weighted mean; $I-$statistical convergence; Korovkin type approximation theorem; Positive linear operator*

On some regular polyhedrons in the Taxicab space

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Abstract

Euclidean regular polyhedrons which are also Taxi regular polyhedrons in the analytical 3-space were studied. The existences of Taxi regular polyhedrons which are not Euclidean regular polyhedrons were researched. It was identified that the Taxi cube (Euclidean rectangular prism) is the only Taxi regular polyhedron which is not Euclidean regular polyhedron.

Keywords: *Taxi geometry; Taxi regular polygons; Taxi regular polyhedrons; Line segment with equal Taxi lengths*

On Ig-continuous functions

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Abstract

In this paper, we introduce a new class of functions called Ig-continuous functions. We obtain several characterizations and some of their properties. Also, we investigate its relationship with other types of functions.

Keywords: *Ig-continuous; rIg-closed set; rIg-continuous; Strongly I-continuous; Strongly rIg-continuous functions*

An aspect of graph associahedron via tubes

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Abstract

In this study, we interpret Loday's realization of an associahedron in terms of the algorithm given by Devadoss. In other words, we construct the realization of an associahedron via tubes. We briefly give how to get an associahedron out of tubings and the geometric and topological properties of such an associahedron. On the other hand, for tubings on an n-path we define plumbing and Loday dendriform algebra of maximal tubings. Moreover, the construction of an operad structure of the sequence of associahedrons and the module structure of the sequence of cylohedrons are given in terms of tubings.

Keywords: *Graph associahedron; Dendriform algebra; Realization; Operad*

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γ-Lie structures in γ-prime gamma rings with derivations

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Abstract

Let M be a γ-prime weak Nobusawa Γ-ring and $d \neq 0$ be a k-derivation of M such that $k(\gamma) = 0$ and U be a γ-Lie ideal of M that is not contained in C_γ. In this paper, we prove that if $\mathrm{char}M \neq 2$ and $d^3 \neq 0$, then the γ-subring generated by $d(U)$ contains a nonzero ideal of M. We also prove that if $[u, d(u)]_\gamma \in C_\gamma$ for all $u \in U$, then U is contained in the γ-center of M when $\mathrm{char}M \neq 2$ or 3. And if $[u, d(u)]_\gamma \in C_\gamma$ for all $u \in U$ and U is also a γ-subring, we prove U is γ-commutative when $\mathrm{char}M = 2$.

Keywords: *Gamma ring; γ-prime gamma ring; γ-Lie ideal; k-derivation; Commutativity*

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Fixed point theorems for multifunctions in vector valued metric spaces

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Abstract

In this study, we introduce fixed point results for set valued contractions in spaces endowed with the vector valued metrics.

Keywords: *Fixed point theory; Vector valued metric; Multifunctions*

Symmetry type curvature conditions of lightlike surfaces in 4-dimensional Minkowski space-time

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Abstract

In this paper, the curvature conditions of symmetry type of lightlike surfaces, particularly of totally umbilical lightlike surfaces, in 4-dimensional Minkowski spacetime are investigated.

Keywords: *Lightlike surfaces; Symmetry conditions; Minkowski spacetime; Totally umbilical*

Spectrum and fine spectrum of the upper triangular triple-band matrix over some sequence spaces

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Abstract

The fine spectra of lower triangular triple-band matrices was examined by several authors. Recently, Karakaya and Altun determined the fine spectra of upper triangular double-band matrices over the sequence spaces c_0 and c. In this paper, we determine the fine spectra of the upper triangular triple-band matrix over the sequence spaces c_0, c and ℓ_∞. Additionally, we give the approximate point spectrum, the defect spectrum and the compression spectrum of the matrix operator $A(r,s,t)$ over the spaces c_0, c and ℓ_∞ with some applications. Furthermore, we give the graphical representations of the spectrum of the triangular triple-band matrix over the sequence spaces c_0. These results are more general than the corresponding results obtained by Karakaya and Altun.

Keywords: *Spectrum of an operator; Upper triple band matrix; Spectral mapping theorem; Goldberg's classification*

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Some spectral properties of matrix-valued differential operators

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Abstract

In the study, we investigate Jost function and resolvent of second order non-selfadjoint matrix differential equation. Using the analytic continuation and the uniqueness theorems of analytic functions, we study the eigenvalues and the spectral singularities of this equation.

Keywords: *Differential operators; Jost function; Eigenvalues; Spectral singularities*

Note on the rigid body motion

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Abstract

The geometry of invariant characteristics is one of the most researched area in kinematics. In this study, we give an efficient method to obtain the sentence of fixed points of rigid body motions.

Keywords: *Rigid body motion; Screw motion; Dual quaternion*

On the best approximate centrosymmetric solution of the quaternion matrix equations $AXB = C$, $DXE = F$

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Abstract

Suppose that the quaternion matrix equations $AXB = C$, $DXE = F$ are given, where X is an unknown quaternion matrix and A, B, C, D, E, and F are known quaternion matrices of suitable size. In this paper, the explicit expression of the best approximate solution of matrix nearness problem over the set of centrosymmetric quaternion matrices is established for this system of quaternion matrix equations by using Moore–Penrose Inverse, the Kronecker product, and the complex representations of quaternion matrices. Moreover, a numerical algorithm is added for finding the solution of the problem considered at the end of the study.

Keywords: *Best approximate solution; Matrix nearness problem; Quaternion matrix equation; Moore–Penrose generalized inverse; Least squares solution*

Local behavior of certain elliptic equations

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Abstract

The local behavior of some elliptic equations of the steady states of reaction diffusion equations is studied. It is well known that the competition between the produced rate, removal rate and diffusion coefficient affect the solution behavior. Such a phenomenon is called Turing instability. The purpose of this article is to discuss how the value of the interior point of the initial value tangles with these parameters when the competition of these parameters reach the balanced states. The mathematical meaning of balanced states will be specified in the article. It is interesting that the behavior of such a state coincides with positive conclusion of Lin-Ni conjecture.

Keywords: *Reaction diffusion; Steady states; Turing system; Local behavior*

Some characterizations of M-matrices and inverse M-matrices

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Abstract

The class of M-matrices plays a very important role in matrix theory as well as in some other areas. One of the most beatiful properties of M-matrices is that the inverse of an M-matrix is nonnegative. The converse, however is not true in general. In this study, we review some characterizations of nonsingular M-matrices and give some characterizations for triangular inverse M-matrices.

Keywords: *M-matrix; Inverse M-matrix; Triangular unit diagonal matrix*

On the study of some impulsive initial value problem of fractional multi-orders

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Abstract

We shall study in the expected talk an impulsive initial value problem of fractional multi-orders. We obtain the existence, uniqueness and stability of the solution. The derived results are based on the Banach's contraction theorem as well as Schaefer's fixed point theorem. Finally, an illustrative example is given.

Keywords: *Caputo derivative; Impulsive conditions; Banach's fixed point theorem*

Existence of solutions for a class of variational inequalities

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Abstract

In this talk we considered a deformed elastic solid with a unilateral contact of a rigid body which has been studied by Lions, J.L. and G. Stampacchia. So, we studied the existence, uniqueness and continuity of the deformation of this solid with respect to the given data. We proved the existence of solutions for a class of variational inequalities.

Keywords: *Variational inequalities; Elastic deformation; Unilateral contact*

A special family of slant helix in Euclidean space

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Abstract

Slant helices are one of the most important topics of differential geometry. Izumiya and Takeuchi was defined slant helices in Euclidean 3-space which has the property that the principal normal makes a constant angle with a fixed direction. In this study, we introduce a spatial curve with its spherical indicatrices which are slant helices and the curve is called as a C-slant helix.

Moreover, we obtain some characterizations for the C-slant helix with the help of its curvature, torsion and the geodesic curvature of the principal normal vector field. Also, we give a special subfamily of C-slant helix named curves of C-constant precession which has constant speed Darboux vector.

Keywords: *M Slant helix; A curve of constant precession; Spherical indicatrix*

The F-analogue of Riordan representation of Pascal matrices via Fibonomial coefficients

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Abstract

In this study, we obtain an analogue of Riordan representation of Pascal matrices via Fibonomial coefficients. In particular, we establish a relationship between the Riordan array and Fibonomial coefficients by using new $*_F$ operation, and we show that such Pascal matrices can be represented by an F-Riordan pair.

Keywords: *Riordan representation; Fibonomial coefficients; Pascal matrices*

Eikonal V_n-slant helices in n-dimensional pseudo-Riemannian manifold

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Abstract

In the present paper we introduced a new type of curves called as eikonal V_n-slant helice in n-dimensional pseudo-Riemannian manifold. We also give new characterizations about the helix by using the Hessian of a function defined on a pseudo-Riemannian manifold.

Keywords: *Eikonal slant helix; Harmonic curvature*

Eikonal V_n-slant helices in n-dimensional Riemannian manifold

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Abstract

In this work we defined a new type of curves called as eikonal V_n-slant helix in n-dimensional Riemannian manifold. Moreover, we give important characterizations about the helix by using a non-trivial affine function defined on an n-dimensional Riemannian manifold.

Keywords: *Eikonal helice; Eikonal slant helice; Harmonic curvature*

Exponential and Cayley maps for the planar motion group

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Abstract

We investigate two mappings, the exponential and the Cayley maps, between the Lie algebra $\mathfrak{se}(2)$ the planar motion group and the group itself $SE(2)$.

The exponential map has theoretical importance and it connects mechanical joints, but it is not an algebraic map. The classical way, the Cayley map is a rational map. So, the Cayley map has some practical advantages; the usage of numerical methods are more efficient by this map, since it does not need so many trigonometric relations.

Based on these explanations the comparison between the exponential map and the Cayley map on the planar motions ($SE(2)$) is given in this study.

Keywords: *Kinematics; Planar motion; Cayley map; Exponential map; Special Euclidean group* $SE(2)$

A numerical approach for solving Volterra-Integro functional differential equations

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Abstract

In this article, a numerical technique is proposed for solving Volterra-integro functional differential equations. The proposed method is based on a Laguerre series expansion. This method transforms Volterra-integro functional differential equation and the given conditions into a matrix form which corresponds to a system of linear algebraic equations. Also, we solve the system of linear algebraic equations by using Maple 12 and we have the coefficients of Laguerre series expansion. In addition, numerical results are presented and the residual error analysis is developed to demonstrate the efficiency of the proposed method.

Keywords: *Volterra-integro functional differential equations; Laguerre polynomials and series; Approximation methods; Collocation methods; Error analysis*

An efficient method for solving the nonlinear fractional Klein-Gordon type equations

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Abstract

In this paper, an efficient method namely $\left(\frac{G'}{G}\right)$-expansion method for solving the fractional Klein-Gordon type equations is considered. The fractional derivative is described in the Jumarie's modified Riemann-Liouville sense. We obtain the hyperbolic and periodic function solutions of the nonlinear Klein-Gordon and time fractional Klein-Gordon equations. Our method can be used in studying many other fractional equations.

Keywords: *The $\left(\frac{G'}{G}\right)$-expansion method; Modified Riemann–Liouville derivative; Nonlinear fractional Klein-Gordon equation; Time fractional Klein-Gordon equation*

An expansion for Schrödinger equation on finite time scale

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Abstract

In this study, we consider the operator L generated in $L^2_\nabla(a,b]$ by the boundary problem

$$-[y^\Delta(t)]^\nabla + [q(t) + 2\lambda p(t) - \lambda^2]y(t) = 0,\ t \in (a,b],$$
$$y(a) - hy^\Delta(a) = 0,\ y(b) + Hy^\Delta(b) = 0$$

where $p(t)$ is continuous, $q(t)$ is partial continuous, $q(t) \geqslant 0, h \geqslant 0, H \geqslant 0$. We have obtained eigenvalues and eigenfunctions of Schrödinger Operator with a general boundary condition on finite time scale and the formula of convergent expansions in terms of the eigenfunctions in $L^2_\nabla(a,b]$ space.

Keywords: *Time scale; Delta derivatives; Nabla derivatives; Self-adjoint boundary value problem; Symmetric Green's function*

Some results on the nilpotence of the mod-p Steenrod algebra

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Abstract

In this study, we discuss the left and right ideals of the mod-p Steenrod algebra $\mathcal{A}_p$. These are given as $L(k) = \mathcal{A}_p\{\mathcal{P}^{p^0}, \mathcal{P}^{p^1}, \mathcal{P}^{p^2}, \ldots, \mathcal{P}^{p^k}\}$ and $R(k) = \{\mathcal{P}^{p^0}, \mathcal{P}^{p^1}, \mathcal{P}^{p^2}, \ldots, \mathcal{P}^{p^k}\}\mathcal{A}_p$. We determine the smallest k such that $\mathcal{P}^n \in L(k), R(k)$. We show that the nilpotence relation $(Sq^{2^n})^{2n}Sq^1 = 0$ for all integers $n \geq 1$. We finally prove that for all odd prime numbers p, the nilpotence height of $\mathcal{P}^{2p}$ is p and the nilpotence height of $\mathcal{P}^{3p}$ is $p-2$ where $p > 3$ is an odd prime number.

Keywords: *Steenrod algebra; Steenrod powers; Steenrod square; Nilpotency*

The balancing and Lucas-Balancing numbers and k-tridiagonal matrices

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Abstract

In the study, the authors considered one type of k -tridiagonal matrix family whose permanents are specified to the Balancing and Lucas-Balancing numbers which has been recently discovered as solution of Diophantine equation. Moreover they provide some properties combining Chebyshev polynomial properties with the given sequences.

Keywords: *k-tridiagonal matrix; Balancing number; Permanent; Determinant*

On the spectra of some matrices produced from two cubic matrices

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Abstract

In this work, we first define cubic matrices and under some conditions state some results that may be useful in applied sciences. The reason for this is that the class of cubic matrices covers the other some special types of matrices such as idempotent, involutive, tripotent, quadratic, and generalized quadratic matrices. It is a well known fact that these kind of matrices and the spectra of them play a central role in applied sciences. Also, our results establish some relations between the spectrum of the sum of such two matrices and the spectra of some matrices produced from these matrices. Moreover, it has been given some applications of the main result.

Keywords: *Qubic matrix; Generalized quadratic matrix; Idempotent matrix; Spectrum; Diagonalization*

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Two kinds of mixed almost unbiased estimators

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Abstract

In this paper, two kinds of mixed estimators are introduced based on prior information in the linear model with stochastic linear restrictions for the unknown vector parameter when stochastic linear restrictions on the parameters hold. We show that the new estimators are generalization of the mixed estimator (ME), the almost unbiased ridge estimator (AURE), the almost unbiased Liu estimator (AULE) and the least squares estimator (LSE) . The performances of the new estimators in comparison to other estimators in terms of the mean squares error matrix (MMSE) are examined. Numerical example from literature and simulation study have been given to illustrate the results.

Keywords: *Mixed estimator; Stochastic linear restrictions; Almost unbiased ridge estimator; Almost unbiased Liu estimator*

On the separation properties of AP

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Abstract

The topological construct AP of approach spaces and contractions is a generalization of metric spaces, based on point-to-set distances, instead of point-to-point distances [2]. Recall that, there are various generalizations of separation properties to topological constructs introduced by Baran [1]. In this study, our aim is to characterize the separation properties in AP and compare them with the descriptions given in [3].

Keywords: *Topological category; Approach space; Separation property*

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Slant helix curves and acceleration centers

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Abstract

In the study, an alternative one-parameter motion to Frenet motion of a rigid-body in 3-dimensional Euclidean space is given by moving the coordinate frame {N,C,W} instead of the Frenet frame {T,N,B} along a unit speed curve, where N, C and W correspond to, respectively, unit principal normal vector field, derivative vector field of the unit principal normal vector field and Darboux vector field of the unit speed curve. Also the concepts fixed axode, striction curve, instantaneous pole points, acceleration pole points (or acceleration centers) and instant screw axis (ISA) of this alternative one-parameter motion are analyzed.

Keywords: *C-Slant helix; Striction curve; Rigid-body motion; Acceleration center*

Variational approach to curves on semi-Riemannian Manifolds

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Abstract

In this paper, we give a variational approach to the magnetic flow associated with the Killing magnetic field on a three dimensional semi-Riemannian manifold. Then, we investigated the trajectories of these magnetic fields and give some characterizations of these curves.

Keywords: *Special curves; Vector fields; Flows; Ordinary differential equations*

A numerical solution of the KdVB equation

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Abstract

A numerical solution of the Korteweq-de Vries Burgers' (KdVB) equation is presented by Petrov-Galerkin method. The accuracy and efficiency of the methods are discussed by computing error norms L_2 and L_∞. Also three invariants of the motion are calculated to determine the conservation properties of the scheme.

Keywords: *Finite element method; KdVB equation; B-splines*

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On the basis properties of eigenfunctions of a Sturm-Liouville problem with interface conditions

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Abstract

In this study we shall investigate the eigenfunctions of a Sturm - Liouville type problem which consist of a Sturm - Liouville equation $-u''(x)+q(x)u(x) = \lambda r(x)u(x)$ on two disjoint intervals $[-1, 0)$ and $(0, 1]$ together with interface conditions at the point of interaction $x = 0$ and with eigenparameter dependent boundary conditions. Here the functions $q(x)$ and $r(x)$ are measurable and Lebesgue integrable on $[-1, 1]$, and the function $r(x)$ are positively definite. Note that some special cases of the considered problem arise after an application of the method of separation of variables in heat transfer problems, in vibrating string problems when the string is loaded additionally with point masses, in diffraction problems etc. It is shown that the eigenfunctions of considered problem form a Riesz basis in the modified Hilbert space.

Keywords: *Sturm-Liouville problems; Eigenfunctions; Boundary and transmission conditions; Riesz basis*

BSDE associated with Lévy processes with superlinear quadratic coefficient

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Abstract

We deal with backward stochastic differential equations (BSDE in short) driven by Teugel's martingales and an independent Brownian motion. We prove the existence of a solution for these equations when the coefficient is continuous, it has a superlinear growth in "y" and quadratic growth in "z". As applications, we give a probabilistic interpretation for a large class of partial differential integral equations (PDIE in short).

Keywords: *Backward stochastic differential equations; Lévy processes; Teugel's martingales; Partial differential integral equations*

Dissipative extensions of fourth order differential operators with matrix potentials

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Abstract

In this article, we give a description of all maximal dissipative, self adjoint and other extensions of fourth order differential operators with matrix potentials in terms of boundary conditions.

Keywords: *Dissipative extensions; Self adjoint extensions; Boundary value space; Boundary condition*

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A new method for controllability and observability of linear time-varying and time-invariant systems

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Abstract

In this paper, a new technique is proposed for computing the power of a matrix. It is not important even this matrix is diagonalizable or not, our approach apply for both. In fact we give an interesting recurrence relation for the characteristic polynomial of matrix, then by solving this recurrence relation we obtain the power of this matrix. Finally, we can use this approach for checking the controllability and observability by applying Gramian method. Illustrative examples are included to demonstrate the validity and applicability of our technique.

Keywords: *Minimal polynomial; Characteristic polynomial; Controllability and observability of systems; Recurrence relation*

A sextic B-spline finite element method for solving the nonlinear Schrödinger equation

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Abstract

The sextic B-spline collocation algorithm is set up to find the numerical solution of the nonlinear Schrödinger equation. The effect of use of the higher degree B-spline in the collocation method is searched for getting the numerical solution of the Schrödinger equation. The three test problems are studied to show the robustness of the suggested method.

Keywords: *Schrödinger equation; Soliton; Collocation; Sextic B-spline*

The exponential cubic B-spline algorithm for equal width equation

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Abstract

A numerical solution of the Equal Width Equation is obtained using collocation method based on exponential cubic B-spline method. Propagation of solitary wave, interaction of two solitary waves, wave undulation are studied using the proposed method. Comparisons are made with analytical solutions. Accuracy and efficiency are shown by computing the numerical conserved laws and L_2, L_∞ error norms.

Keywords: *Collocation methods; Exponential cubic B-spline; Equal width wave equation*

On critical buckling loads of columns under end load dependent on direction

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Abstract

Most of the phenomena of various fields of applied sciences are nonlinear problems. Recently, various types of analytical approximate solution techniques were introduced and successfully applied to the nonlinear differential equations. One of the aforementioned techniques is the Homotopy Analysis Method (HAM). In this study, we applied HAM to find critical buckling load of a column under end load dependent on direction. We obtained the critical buckling loads and compared them with the exact analytic solutions in the literature.

Keywords: *Homotopy analysis method; Series solution; Euler column; Buckling load; End load*

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Quartic B-spline differential quadrature method for advection-diffusion equation

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Abstract

In the study, Quartic B-spline differential quadrature method (QRDQM) algorithm is constructed to obtain numerical solutions of Advection-Diffusion equation. The spatial discretization of the equation has been accomplished by QRDQM, then the resultant ordinary equation system is integrated in time by Runge-Kutta methods of various orders. In order to measure the accuracy of the method and compare with some earlier works, L_2 and L_∞ error norms are computed. A matrix stability analysis is also performed.

Keywords: *Differential quadrature method; B-splines; Advection-diffusion equation*

Numerical solution of nonlinear Burger's equation

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Abstract

In the study, numerical solution of nonlinear Burgers' equation (NBE) is studied. First, NBE is discretized using differential quadrature method based on quintic B-spline functions in space domain. The space-discretized equation integrated in time using Runge-Kutta method. Two well-known initial boundary value problems are chosen as test problems to simulate the numerical solutions. The accuracy of the method has been measured by some widely-used norms and stability of the method also has been studied by matrix stability method.

Keywords: *Quintic B-splines; Nonlinear Burger's equation; Differential quadrature method; Stability*

Numerical solution of Equal Width equation by cubic B-spline quasi-interpolation

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Abstract

In this study, we present a numerical method to solve the Equal Width (EW) equation, based on cubic B-spline quasi-interpolation for the space integration and Crank-Nicolson method for the time integration. The method is tested on the problems of propagation of a solitary wave and interaction of two solitary waves. The three conservation quantities of the motion are calculated to determine the conservation properties of the proposed algorithm.

Keywords: *Equal Width equation; Quasi spline; Solitary wave; Crank-Nicolson*

Nonlinear differential systems with limit cycles

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Abstract

With the help of Bernoulli equation we establish a new class of planar polynomial vector field of the form:

$$\begin{cases} \dot{x} = -y\left(x^2+y^2\right)^l + xR_{2l}(x,y) + xS_m(x,y) \\ \dot{y} = -x\left(x^2+y^2\right)^l + yR_{2l}(x,y) + yS_m(x,y) \end{cases}$$

where R_{2l} and S_m are homogeneous polynomials of degrees $2l$ and m respectively, with $2l < m$, which has at most one explicit limit cycle.

Keywords: *Polynomial vector field; Non algebraic limit cycle; Stability*

Variational homotopy perturbation method for the approximate solution of the foam drainage equation with time and space fractional derivatives

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Abstract

In this paper, variational homotopy perturbation method (VHPM) is applied for solving the foam drainage equation with time and space-fractional derivatives. Numerical solutions are obtained for various values of the time and space-order derivative in (0,1]. For the first-order time derivative, compared with the exact solution, the result showed that this method is as alternative method for obtaining an analytic and approximate solution for different types of differential equations.

Keywords: *Caputo fractional derivative; Variational homotopy perturbation method; Foam drainage equation; Fractional differential equations*

On the asymptotic normality of Hill's estimator adapted to censored data

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Abstract

In the analysis of lifetime, reliability or insurance data, the observations are not always available: they are usually randomly censored. We model this situation by introducing a non-negative random variable (rv), called censoring rv, independent of the rv of interest. Then, we consider the minimum of the two rv's and an indicator rv which determines whether or not there has been censorship. The analysis of extreme values of randomly censored data is a new research topic in which we are interested in this work. We make use of the empirical process theory to approximate the adapted Hill estimator, for censored data, in terms of Gaussian processes, then we derive its asymptotic normality, only under the usual second-order condition of regular variation. The newly proposed Gaussian approximation agrees perfectly with the asymptotic representation of the classical Hill estimator in the non censoring framework. Our result will be of great interest to establish the limit distributions of many statistics related to extreme value theory under random censoring, such as the estimators of tail indices, actuarial risk measures and goodness-of-fit functionals for heavy-tailed distributions.

Keywords: *Censoring; Empirical process; Gaussian approximation; Hill estimator*

Hermite-Hadamard type inequalities for harmonically convex functions on the co-ordinates

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Abstract

A function $f : [a, b] \subset \mathbb{R} \to \mathbb{R}$ is said to be convex if whenever $x, y \in [a, b]$ and $t \in [0, 1]$, the following inequality holds:

$$f(tx + (1 - t)y) \leq tf(x) + (1 - t)f(y)$$

In recent years, new classes of convex functions have been introduced in order to generalize the results and to obtain new estimations. We also introduce the concept of harmonically convex functions on the co-ordinates. Also, we establish some inequalities of Hermit-Hadamard type as S.S. Dragomir's [1] results in Theorem 2 and other Hermit-Hadamard type inequalities for these classes of functions.

Keywords: *Harmonically convex function; Hermite-Hadamard type inequality*

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On the 2-rainbow domination in graphs

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Abstract

In a communication network, the vulnerability measures the resistance of the network to disruption of operation after the failure of certain stations or communication links. We can use vulnerability measures to investigate vulnerability of network. In this paper, we mention about domination number and 2-rainbow domination number in graphs and also generalize the 2-rainbow domination numbers of some graphs.

Keywords: *Graph theory and networks; Domination number; 2-rainbow domination number*

Estimation procedure for Archimedean copulas based on the trimmed L-moments method

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Abstract

A new semiparametric estimation method for multi-parameters Archimedean copulas based on the Trimmed L-moments theory is proposed. Consistency and asymptotic normality of the defined estimator are established. Extensive simulation study to compare estimators based on the Trimmed L-moments, the maximum likelihood and the measures of concordance is carried out.

Keywords: *L-moments; Trimmed L-moments; Copulas; Dependence; Concordance measures; Semiparametric estimation*

Probabilistic soft multiset theory

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Abstract

The concept of soft set theory as a general mathematical tool for dealing with uncertainty was introduced by Molodtsov in 1999. Alkhazaleh and Salleh in 2011 introduced the definitions of a soft multiset as a generalization of Molodtsov's soft set, [2]. In this paper, we incorporate Alkhazaleh and Salleh's soft multiset theory with probability theory, [1] and then propose the notion of probabilistic soft multisets. We define equality of two probabilistic soft multisets, subset, complement of a probabilistic soft multiset, impossible probabilistic soft multiset, certain probabilistic soft multiset with examples. We also introduce the operations of union, intersection, difference and symmetric difference on probabilistic soft multisets.

Keywords: *Soft sets; Soft multisets; Probabilistic soft sets; Probabilistic soft multisets; Probabilistic soft multisets operation*

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On some new operations in probabilistic soft set theory

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Abstract

In this paper, we study the theory of probabilistic soft sets introduced by Zhu and Wen, [1]. We define equality of two probabilistic soft sets, subset, complement of a probabilistic soft set, impossible probabilistic soft set, certain probabilistic soft set with examples.We also introduce the operations of union, intersection, difference and symmetric difference on probabilistic soft sets. We prove that certain De Morgan's laws hold in probabilistic soft set theory with respect to these new definitions.

Keywords: *Soft sets; Probabilistic soft sets; Probabilistic soft sets operations*

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Nonlinear water waves (KdV) equation and Painlevé's Technique

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Abstract

The Korteweg–de Vries (KdV) equation which is the third order nonlinear PDE has been of interest since Scott Russell (1844). In this paper we study this kind of equation by Painlevé's equation and through this study, we find that KdV equation satisfies Painlevé's property, but we could not find a solution directly, so we transformed the KdV equation to the like-KdV equation, therefore, we were able to find four exact solutions to the original KdV equation.

Keywords: *Korteweg–de Vries equation; Painlevé's property; Resonance points; Exact solutions*

Some large sets in $\mathbb{Z}[i]$

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Abstract

In the recent century one of the celebrated theorem in additive combinatorics is Green-Tao Theorem: "primes contain arbitrary long arithmetic progressions". This theorem comes as a particular case of Erdos conjecture: if A be a subset of $\mathbb{N}$ with the property that $\sum_{n\in A} 1/n \to \infty$ then A contains arithmetic progressions arbitrary length. Green-Tao Theorem is greatly indebt to Furstenberg ergodic theoretic proof of Szameredi's Theorem. This theorem states that every subset of $\mathbb{N}$ with positive upper Banach density of contains arbitrary long arithmetic progressions. Szameredi's Theorem was purely combinatorial and involves sophisticated graph theoretic method. Furstenberg translated Szameredi's proof in ergodic theoretic set up. Tao and Green, in their proof used a concept of "positive relative density" with respect to primes. Main invention in their proof is to introduce so called pseudo random measure. In 2006 Terence Tao himself extended Green-Tao Theorem for the integral domain $\mathbb{Z}[i]$, the set of Gaussian integers. In 2010 Tao's scholar Thai Hoang Le extended Green-Tao Theorem for function fields $\mathbb{F}_q[x]$. Furstenberg ergodic theoretic proof of Szameredi's Theorem was so powerful that it opened a new branch in research, called "Ergodic Ramsey Theory". Vitaly Bergelson was the first person who investigated combinatorial structures of subsets of $\mathbb{N}$ with positive multiplicative density. Using various ergodic multiple recurrence theorems, Bergelson proved that multiplicatively large sets i.e. sets with positive multiplicative density have a rich combinatorial structure. He proved that for any multiplicatively large set $A \subset \mathbb{N}$ and any $k \in \mathbb{N}$, there exists $a, b, c, d, e, q \in \mathbb{N}$ such that $\{q^j(a + id) : 0 \leq i, j \leq k\} \subset A$ and $\{b(c + ie)^j : 0 \leq i, j \leq k\} \subset A$. In this presentation we extend these results for integral domains $\mathbb{Z}[i]$.

Keywords: *Ergodic theory; Ramsey theory; Folner density*

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Determination of position vector of a developable q-slant ruled surface in the Euclidean 3-space E^3

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Abstract

In this study, we determine the position vector of a developable q-slant ruled surface in the Euclidean 3-space E^3 by means of the Frenet frame of the directing cone of a q-slant ruled surface. First, we determine the natural representations for the striction curve and the ruling of a q-slant ruled surface. Then, we obtain a general parameterization of a developable q-slant ruled surface with respect to the conical curvature of its directing cone. Finally, we give some examples for the obtained results.

Keywords: *Position vector; Slant ruled surface; Developable ruled surface.*

Modeling tumor growth using differential equations with piecewise constant arguments

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Abstract

In this paper, we consider a system of differential equations with piecewise constant arguments for the interaction between tumor and immune system cells. The solution of the system of differential equations with piecewise constants arguments leads to system of difference equations. To investigate local and global behaviour of the system, we use Schur-Cohn criterion and Lyapunov functions. Neimark-Sacker bifurcation analysis of the system shows that periodic solutions occur around the positive equilibrium point as a result of stable limit cycle.

Keywords: *Piecewise constant arguments; Difference equation; Stability; Bifurcation*

Application of the septic B-spline collocation method to the MRLW equation

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Abstract

In this paper, septic B-spline collocation method is implemented to find a numerical solution of the modified regularized long wave (MRLW) equation. Three test problems including the single soliton, interaction of two and three solitons are studied to validate the proposed method by calculating the error norms L_2, L_∞ and invariants I_1, I_2 and I_3. Also, we studied the Maxwellian initial condition pulse. The numerical results obtained by the method show that the present method is marginally accurate and efficient. Results are compared with some earlier results given in the literature. A linear stability analysis of the method is also investigated.

Keywords: *Finite element method; MRLW equation; Collocation; B-splines*

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On almost B-Walker 4-manifolds

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Abstract

This study is concerned with 4-dimensional almost B-structures of neutral signature on Walker 4-manifolds. For these structures, we study conditions of Holomorphic(Kähler) manifolds. Also, we give an example of flat almost B-manifold, which consists of a nonintegrable almost paracomplex structure on Walker 4-manifolds.

Keywords: *Almost paracomplex structure; B-metric; Neutral metric; Walker metric; Kähler structure*

Quasimodules and normed quasimodules on a quasiring

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Abstract

In this study, we give the definition of quasiring as a new structure. The concept of quasiring is a generalization of ring and semiring notions, also this new concept is different from ordered semiring. Morever we give the relation of between quasiring and field. On the other hand, we introduce the concepts of quasimodules and normed quasimodules defined on a quasiring as a generalization of the quasilinear spaces and normed quasilinear spaces, respectively given by [1]. Also, we obtain some results related to these notions. We think that investigation of quasimodules on a quasiring may provide important contributions to improvement of the quasilinear functional analysis especially, to the duality theory of quasilinear spaces in addition that the notion of quasimodule is more suitable backdrop as regards theory of quasilinear spaces in examination of quasilinear functional.

Keywords: *Ordered semiring; Quasiring; Quasilinear spaces; Quasimodules; Normed quasimodules*

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A new approach to intuitionistic fuzzy soft matrices

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Abstract

In this work, we first redefined the intutionistic fuzzy soft matrices and their operators to make them more functional in the theoretical studies. We then defined products of intuitionistic fuzzy soft matrices and their related properties. We finally constructed a soft max-min decision making method which can be successfully applied to the problems that contain uncertainties.

Keywords: *Soft sets; Intuitionistic fuzzy soft sets; Intuitionistic fuzzy soft matrices*

Gaussian approximations to a tail Kaplan-Meier process toward the extreme tail index estimation under random censoring

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Abstract

The weak approximations of the tail empirical processes for heavy-tailed distribution in the case of complete data have been established by many authors. In this paper, we consider the random censoring setting throughout a tail Kaplan-Meier process. Our results will be of great interest to establish the limit distributions of many statistics in extreme value theory for randomly censored data such as the estimators of tail indices, the actuarial risk measures and the goodness-of-fit functionals. In this context, new estimators of the tail index are introduced and their consistency and asymptotic normality are established. Extensive simulation study is carried out to investigate the performance of the proposed estimators. We concluded that these latter perform better the adapted Hill one which is proposed by [1], as well as the bias and the root mean squared error are considered. For further application, we introduce a new goodness-of fit test statistic for heavy-tailed distributions under random censorship.

Keywords: *Goodness-of fit tests; Hill's estimator; Heavy-tail; Kaplan-Meier estimator; Random censoring; Tail index estimation*

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A view to set theoretic complete intersection ideals

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Abstract

One of the interesting and long-standing problems in both commutative algebra and algebraic geometry is to find out conditions for the equality between height, cohomological dimension, arithmetical rank and analytic spread of an ideal in a local ring (R, m). The first part of the talk is to give the conditions in which some of the above inequalities turn to the equality. For this reason, an introduction to the so called formal local cohomology modules will be given. Then using this we consider the cohomological dimension of an ideal with a view to the set theoretically (cohomologically) complete intersection ideals.

Keywords: *Set-theoretically and cohomologically complete intersection ideals; Analytic spread; Monomials; Formal grade; Depth of powers of ideals*

Cohomology and deformations of Hom-bialgebras and Hom-Hopf algebras

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Abstract

Hom-bialgebra structures, the associativity, and the coassociativity conditions $(xy)z = x(yz)$ and $(\Delta \otimes id) \circ \Delta = (id \otimes \Delta) \circ \Delta$ are twisted to $\alpha(x)(yz) = (xy)\alpha(z)$ and $(\Delta \otimes \alpha) \circ \Delta = (\alpha \otimes \Delta) \circ \Delta$, respectively, with α a map in the appropriate category. In the present paper, we consider the deformation theory of Hom-bialgebra, there is a natural concept of infinitesimal deformation. These infinitesimals are elements of a cohomology group, there is also a natural concept of rigidity.

Keywords: *Hom-bialgebra; Deformation; Rigidity; Coassociativity*

Soft bitopological spaces

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Abstract

In 1999, Molodtsov [1] introduced the concept of soft sets which can be seen as a new mathematical tool for dealing with uncertainty. In 1963, Kelly [2] introduced the bitopological space by using two different topologies. In this paper, we first define soft bitopological space on a soft set. Furthermore, the notions of soft open set, soft closed set, soft neighborhood, soft limit point and soft Hausdorff space are studied and several related properties and some characterization theorems are investigated.

Keywords: *Soft sets; Soft bitopology; Soft open-closed set; Soft neighborhood; Soft Hausdorff space*

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A new descent algebra of Weyl groups of type A_n

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Abstract

In the study, we define an equivalence relation on the set of all x_J in order to form a basis for a new descent algebra of Weyl groups of type A_n. By means of this, we construct a new commutative and semi-simple descent algebra of Weyl groups of type A_n generated by equivalence classes arising from this equivalence relation.

Keywords: *Weyl groups; Descent algebra*

A semiparametric estimation of copula models based on the method of moments

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Abstract

Using the classical estimation method of moments, we propose a new semiparametric estimation procedure for multi-parameter copula models. Consistency and asymptotic normality of the obtained estimators are established. By considering an Archimedean copula model, an extensive simulation study, comparing these estimators with the pseudo maximum likelihood, rho-inversion and tau-inversion ones, is carried out. We show that, with regards to the other methods, the moment based estimation is quick and simple to use with reasonable bias and root mean squared error.

Keywords: *Archimedean copulas; Asymptotic distribution; Copula models; Measures of association; Method of moments*

Index of semidirect product of Hom-Lie algebras

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Abstract

A Hom-algebra structure is a multiplication on a vector space where the structure is twisted by a homomorphism. In this paper, we introduce the notation of the index of Hom-Lie algebras in the case of coadjoint and an arbitrary representation. We also give the index of semidirect products of Hom-Lie algebras.

Keywords: *Hom-Lie algebras; Representation; Coadjoint representation; Semidirect product*

Asymptotics of orthogonal polynomials with a generalized Szegő condition

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Abstract

We study the pointwise asymptotics inside the unit disk for orthogonal polynomials with respect to a measure belonging to the polynomial Szegő class and perturbed by a finite Blaschke sequence of point masses outside the unit disk. Moreover, we show that these asymptotics hold in L^2-sense on the unit circle.

Keywords: *Orthogonal polynomials; Asymptotic behavior*

Bour's minimal surface revisited: the irreducible implicit equation of the incomplete surface

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Abstract

We focus on the differential geometry of the Bour's minimal surface in Euclidean 3-space. We also calculate the mean curvature, the Gaussian curvature, class, degree, index, total curvature, irreducible implicit equation of the incomplete algebraic minimal surface. Furthermore, we reveal amazing figures.

Keywords: *Bour's minimal surface; Conformal map; Branch point; Weierstrass representation*

On recognition of the alternating cube module of special linear groups

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Abstract

Let $q = p^f$ be a prime power. Suppose that H satisfying $SL(d, q) \leq H \leq GL(d, q)$ is isomorphic to $G = \langle X \rangle$ acting irreducibly on W which is the Alternating cube module of dimension n in $SL(n, q)$. We present an algorithm which takes as an input G and constructs a d-dimensional projective representation of G.

Keywords: *Special linear groups; Alternating cube module*

Estimation of a loss function for spherically symmetric distribution with constraints on the norm

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Abstract

In this paper, we consider the problem of estimating the quadratic loss of point estimators of a location parameter θ for family of symmetric distribution with known scale parameter, when its norm satisfies different constraints and when a residual vector U is available. We compare the robust and non robust estimators and condition on the distribution for the domination of competing estimators are given. In particular we show that it occurs for t-distributions when the dimension of the residual vector is sufficiently large. The main tools in the development are upper and lower bounds on the risk are exact at $\theta = 0$.

Keywords: *Spherical symmetry distribution; Quadratic loss; Unbiased loss estimator; Robust estimators; Minimaxity*

On Sandwich theorem of P-valent functions involving Dziok-Srivastava operator

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Abstract

The aim of this paper is to investigate some properties of the subordination and superordination for p-valent functions associated with Dziok - Srivastava operator .

Keywords: *Subordination; Superordination; Hypergeometric functions; Multivalent functions.*

Decay property of regularity-loss type for solutions in elastic solids with voids

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Abstract

In this paper, we consider the Cauchy problem for a system of elastic solids with voids. First, we show that a linear porous dissipation leads to decay rates of regularity-loss type of the solution. We show some decay estimates for initial data in $H^s(\mathbb{R}) \cap L^1(\mathbb{R})$. Furthermore, we prove that by restricting the initial data to be in $H^s(\mathbb{R}) \cap L^{1,\gamma}(\mathbb{R})$ and $\gamma \in [0,1]$, we can derive faster decay estimates of the solution. Second, we prove that by adding a viscoelastic damping term, then we gain some regularity of the solution and obtain the optimal decay rate.

Keywords: *Decay rate; Stability; Regularity loss; Regularity gain; Energy method.*

General boundary stabilization of memory-type thermoelasticity

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Abstract

In this paper we consider an n-dimensional system of thermoelasticity, where a viscoelastic dissipation is acting on a part of the boundary. We are concerned with the following problem:

$$\begin{cases} u_{tt} - a \triangle u + \beta \nabla \theta + |u|^{p-2} u = 0 & \text{in } \Omega \times \mathbb{R}^+ \\ c\theta_t - k \triangle \theta + \beta div u_t = 0 & \text{in } \Omega \times \mathbb{R}^+ \\ u(.,0) = u_0,\ u_t(.,0) = u_1,\ \theta(.,0) = \theta_0, & x \in \Omega \\ u = 0, & \text{on } \Gamma_0 \times \mathbb{R}^+ \\ u(x,t) = -\int_0^t g(t-s)\, a \frac{\partial u}{\partial \nu}(s)\, ds & \text{on } \Gamma_1 \times \mathbb{R}^+ \\ \theta = 0, & \text{on } \partial\Omega \times \mathbb{R}^+, \end{cases}$$

for $p > 2$, a, c, k, β are positive constants, Ω is a bounded domain of $\mathbb{R}^n$, with a smooth boundary $\partial\Omega$, such that $\{\Gamma_0 \cup \Gamma_1\}$ is a partition of $\partial\Omega$, with meas $(\Gamma_0) > 0$, ν is the outward normal to $\partial\Omega$, $u = u(x,t) \in \mathbb{R}^n$ is the displacement vector, $\theta = \theta(x,t)$ is the difference temperature, and g is the relaxation function considered to be positive, nonincreasing and belongs to $W^{1,2}(0,+\infty)$. The boundary condition on Γ_1 is the nonlocal viscoelastic condition responsible for the memory effect. We establish a general decay result, from which the usual exponential and polynomial decay are only special cases.

Keywords: *Thermoelasticity; General decay; Memory*

On positive integer powers for one type of circulant and skew circulant matrices

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Abstract

Pentadiagonal and tridiagonal matrices have a wide number of applications in various fields of science such as mechanics, image processing, mathematical chemistry, etc.. Similarly, circulant and skew circulant matrices arise in applications involving the discrete Fourier transform and the study of cyclic codes for error correction. Solving some difference equations, differential equations and delay differential equations, scientists meet the necessity to compute the arbitrary positive integer powers of some special square matrices. In the most common of these methods, inverses of some special square matrices are encountered. In this study, we derive the general expression for the entries of the q^{th} $(q \in \mathbb{Z})$ powers for one type of complex circulant $circ_n(0, a, 0, ..., b)$ and skew circulant matrices $scirc_n(0, a, 0, ..., -b)$.

Keywords: *Matrix power; Circulant matrix; Skew circulant matrix; Chebyshev polynomial*

Approximate minimization algorithm for the 0/1 Knapsack problem based on algebra of fractions

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Abstract

We take Minimization of 0/1 Knapsack Problem [1,2]:

$$R_{min} = \min \left\{ \sum_{i=1}^{n} p_i x_i \middle| \sum_{i=1}^{n} w_i x_i \geq c, x_i \in \{0,1\}, i = 1, ..., n \right\}$$

R_{min} problem is in NP- hard class and different approximation algorithms have been developed to solve it [1,2]. In this study, we develop an approximation algorithm for R_{min} based on algebra of fractions [3].
In order to solve this type of problems, one needs operations (coordinatewise operations) on fractions performed by the "numerator - numerator", "denominator - denominator" principle. The operations denoted by $\oplus$, $\otimes$ and $\odot$ are defined on set $\Theta = \{f |\ f = \frac{a}{b};\ a, b \in \mathbb{R}\}$, where $\mathbb{R} = (-\infty, +\infty)$, $\oplus$ and $\otimes$ are binary, and $\odot$ is a unary operation. If R_{min} problem is written as follows, then we can apply techniques that we develop for this problem:

$$RK_{min} = \min \left\{ \sum_{i=1}^{n} p_i x_i \Big/ \sum_{i=1}^{n} w_i x \middle| \sum_{i=1}^{n} w_i x_i \geq c, x_i \in \{0,1\}, i = 1, ..., n \right\}$$

In this study, we propose a Greedy-type algorithm, the so called AMIN, to solve R_{min} problem using the algorithms which is delevoped for RK_{min} problem. We prove the following theorem for this algorithm.

Theorem: AMIN is 1-approximate for R_{min}.

Keywords: *Minimization Knapsack problem; Algebra of fractions; Approximate algorithm*
Acknowledgement: F. Nuriyeva was partially supported by TUBITAK 2216 program.

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A study on some characterizations of null Mannheim curves in E_1^3

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Abstract

In this study, the relations among the invariants of null Mannheim partner curves according to their proper Darboux frame in E_1^3 are obtained. Moreover, we have proved that a null Mannheim curve in E_1^3 is a null helix as well as a null geodesic curve.

Keywords: *Minkowski space; Darboux frame; Mannheim partner curve; Null curve*

On some numerical schemes for fractional order autocatalytic chemical reaction model

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Abstract

Recently, fractional calculus has been successfully exploited in a multitude of applications in several areas, ranging from physics to chemistry and engineering, and this subject has rapidly gained an increasing popularity. The description of some phenomena is more accurate when the fractional derivative is used.

In the present study, some numerical schemes such as Explicit and Implicit Methods, Product Integration Method and Nonstandard Finite Difference Schemes are studied for the numerical solution of the fractional order Brusselator which is a model of the autocatalytic chemical reaction. This model is based on a nonlinear differential equation of order p, where p is a constant in range $0 < p < 1$.

This paper concerns with the numerical simulation of the fractional order autocatalytic chemical reaction model, by means of some numerical simulations, we show the stability preserving properties of the proposed schemes and we compare the results with those provided by a classical method.

Keywords: *Fractional differential equations; Explicit and implicit methods; Product integrations methods; Nonstandard finite difference schemes*

Paraquaternionic structures on tangent bundle with deformed Sasaki metric

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Abstract

For a Riemannian manifold M, we determine some curvature properties of a tangent bundle equipped with the deformed Sasaki metric. In this works we give explicit formulate for the deformed metric on TM and we investigate the paraquaternionic structures (resp. locally para käklerian manifold) on the tangent bundle with respect to this metric.

On derivatives of functions over generalized Cayley-Dickson algebras

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Abstract

Classically, a complex function satisfies Cauchy-Riemann equations if and only if its real Jacobian matrix of partial derivatives is anti-symmetric. This is in accordance with the fact that antisymmetric real 2×2 matrices represents a complex number. Split quaternions can also be represented by real 4×4 matrices of special forms. Recently, a sufficient condition is given for functions over split quaternions in [1] so that the real Jacobian matrix of partial derivatives has this special form. We talk about extensions of these results to a larger class of Generalized Cayley-Dickson Algebras.

Keywords: *Cayley-Dickson algebra; Jacobian matrix; Partial derivative*

References

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Getting Vieth-Muller circle by the Bipolar coordinates

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Abstract

It was acquired the bipolar coordinates by the helping angular coordinates in the binocular vision system. The point chosen from field of sight in the physical space was determined with the bipolar coordinates. It is obtained the curves by the coordinates in the special points of eye and in the point of chosen object. In this study we will introduced to the circle of Vieth-Muller circle from these obtained curves.

Keywords: *Bipolar coordinates; Horopter; Binocular vision*

Free R-algebroids

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Abstract

In this study, after giving some basic data concerning categories, algebroids and directed graphs we construct the free R-algebroids on a directed graph. Moreover, we show that the functor giving the free R -algebroid on a directed graph is the left adjoint of the corresponding forgetfull functor and then we prove some related propositions.

Keywords: *Category; Directed graph; Algebroid; Free algebroid*

A new perturbation-iteration algorithm for fractional differential equations

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Abstract

In this study, previously developed perturbation-iteration method is used to solve some types of fractional differential equations. The study shows that the new method can be applied to many types of FDE's. Some numerical examples are given, and solutions are compared with some other studies to illustrate the efficiency of the method.

Keywords: *Caputo fractional derivative; Fractional differential equations; Initial value problems; Perturbation-iteration method*

Motions and surfaces with constant curvatures which are orbit of circles in Lorentz 3-space

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Abstract

In this work, we investigate the surfaces with constant curvatures which are generated by Lorentzian circles under helicoidal motions and homothetical motions in Lorentz 3-Space.

Keywords: *Helicoidal motion; Homothetical motion; Constant curvature; Lorentz space*

A Riemannian almost product structure which is compatible with Cheeger-Gromoll metric on $(1,1)-$tensor bundle

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Abstract

Let (M,g) be a Riemannian manifold and $T_1^1(M)$ be its $(1,1)-$tensor bundle. In this work, we construct a Riemannian almost product structure on $T_1^1(M)$ with the Cheeger-Gromoll metric and the diagonal lift of the identity tensor. Also we investigate some geometric properties of $T_1^1(M)$ with respect to this structure.

Keywords: *Almost product structure; Cheeger-Gromoll metric; Tensor bundle*

Image inpainting: an application with horizontal masking

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Abstract

Incomplete data is an important issue in data analysis of all areas. There exists a unifed approach to solving this problem and that of data separation: namely, minimizing the norm of the analysis coefficients with respect to particular frame(s). There have been a number of successful applications of this method recently [1,2]. In [1] mathematical theory of shearlets and wavelets are studied in inpainting problem and two methods are compared. In [2] it is shown that shearlets are more effective than wavelets when using vertical, square and random rectangular masking methods on the numerical experiments. In this paper one of the suggested problems in [1] is studied. To be specific, horizontal masking is used for image inpainting problem and results of numerical experiments are presented. Our study confirms that with horizontal masking, shearlet performs better than wavelets.

Keywords: *Inpainting; Shearlets; Sparse representations; Data recovery; Horizontal masking*

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On timelike W-curves in 4-dimensional semi-Euclidean space with index 2

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Abstract

In the study, we investigated the properties of timelike W-curves in 4-dimensional semi-Euclidean space with index 2. We obtain general parametric equations of W-curves and we give some related examples in the same space.

Keywords: *W-curve; Timelike curve; Semi-Euclidean space; Curvatures*

On curve couples with joint Frenet planes in Minkowski 3-space

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Abstract

In mathematics, many researchers has classified the curves according to their some properties. One of the most important examples is Bertrand curves which are the curves whose principal normal vector fields are parallel to each other [1]. The second one is Mannheim curves which are couple curves such that the principal normal of one of them is paralel to the first binormal of the other [2]. Another classification was done for couple curves by S. Özkaldı Karakuş et al [3]. By inspiring them, A.Uçum et al. studied on classification of couple curves in Minkowski 3-space ([4-6]). In the study, we investigated the properties of curve couples with joint Frenet planes in Minkowski 3-space. We give some characterizations for such curves with respect to causal characters of joint Frenet planes. In the present talk, we are going to consider only spacelike joint planes.

Keywords: *Frenet planes; Curvatures; Circular helix; Salkowski and anti-Salkowski curve; Minkowski 3-space*

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Solving third order singularly perturbed diffusion problems by differential transform

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Abstract

In this study, it is examined the singularly perturbed two point boundary value problems by Differential Transform Method (DTM). The method is one of the useful and powerful methods which can be easily applied to linear and nonlinear initial and boundary value problems. As an example, it is studied on the singularly perturbed different types of diffusion problems and the results are compared with either analytical solutions or the solutions obtained by Adomian decomposition method. All results are shown in tables and observed that the method are very effective in solving such kinds of problems.

Keywords: *Singular perturbations; Differential transform method; Third order boundary value problems; Reaction; Convection; Diffusion; The decomposition method*

Characterization of $U_1(\mathbb{Z}[C_n \times C_3])$

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Abstract

Let $C_n^* = C_n \times C_3$ where $C_n =< a : a^n = 1 >$ and $C_3 =< x : x^3 = 1 >$. In this study it was shown that the unit group of the integral group ring $\mathbb{Z}C_n^*$ can be written as an internal direct product of 4 unit groups as follows:

$$U_1(\mathbb{Z}C_n^*) = U_1(\mathbb{Z}C_n) \times U(1+I)\mathbb{Z}C_n \times U(1+J) \times U(1+K\backslash J)),$$

where $I = (1+x+x^2)\mathbb{Z}C_n$, $J = (2-x-x^2)\mathbb{Z}C_n$ and $K = (1-x)\mathbb{Z}C_n \oplus (1-x^2)\mathbb{Z}C_n$. At the end for small n some applications are given.

Keywords: *Unit group; Generator; Rank; Short exact sequences*

Mean square convergence of the flat-top density and failure rate estimators under twice censoring

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Abstract

In this work, we are interested in nonparametric estimation of the density and the failure rate functions of a life time of interest X which is subject to twice censoring. This means that X is right censored by a variable R, $\min(X, R)$ is itself left censored and the latent variables are independent. By analogy with the case of right censored data, we introduce the kernel density and failure rate estimators with infinite-order kernels. Then, we establish the mean square convergence of these estimators with the same rate given for right censored data.

Keywords: *Density estimation, Failure rate estimation, Infinite-order kernels, Thwice censoring*

Hybridizable discontinuous Galerkin method for convection-diffusion-reaction problems

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Abstract

In this study, we present hybridizable discontinuous Galerkin method for the numerical solution of linear convection-diffusion-reaction equations. The most important feature of HDG method when compared with other DG methods is that it reduces the number of globally coupled unknowns significantly when high order approximate polynomials are used. It is very crucial to find stabilization parameter for using HDG method. Therefore, it gives us efficient solutions of that problem.

Keywords: *Hybridizable discontinuous Galerkin method; Convection-diffusion-reaction; Stabilization parameter*

Some properties of bifurcating continued fractions

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Abstract

In this paper, we consider the notion of the bifurcating continued fractions, and then we give some properties of this continued fractions. Furthermore, we give the relationship between the usual continued fractions and bifurcating continued fraction.

Keywords: *Continued fractions; Bifurcation of continued fractions; Euclid algorithm*

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Characterization of torsion symmetric units of ZS_4

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Abstract

Torsion symmetric units of ZS_4 are conjugate to elements of order 2 in S_4. The symmetric elements of ZS_4 can be embedded into a matrix algebra by using irreducible representations of S_4.The torsion symmetric units of ZS_4 can be parameterized by using properties of the matrix algebra.

Keywords: *Integral group ring; Torsion units; Symmetric elements*

On neutrosophic soft sets

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Abstract

Molodtsov [1] initiated the concept of soft set theory, which can be used as a mathematical tool for dealing with uncertainty. In this paper, we first recall the definition and operations of neutrosophic soft sets defined by Maji [2]. Afterwards we redefine the operations of neutrosophic soft sets. By using these operations we introduce some results on the neutrosophic soft set theory. Finally, we construct a decision making method on the neutrosophic soft sets and give an example which shows that the method can be successfully applied to many problems that contain uncertainties.

Keywords: *Soft sets; Neutrosophic sets; Neutrosophic soft sets; Decision making*

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On the existence of the solutions of a semi linear elliptic system

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Abstract

In this talk, we interested with the study of the existence of solutions for a class of semi-linear elliptic systems. Using the topological degree and its application in Schauder's fixed point theorem, under suitable assumptions on the non linearities f and g, we prove the existence of weak solutions.

Keywords: *Fixed point; Homotopy; Topological degree*

A numerical solution of the mKdV equation via the quintic B-spline differential quadrature method

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Abstract

In the present manuscript, the authors solved the modified Korteweg-de Vries (mKdV) equation numerically using a new differential quadrature method based on quintic B-spline functions. In the solution process, the weighting coefficients are found out by semi-explicit algorithm involving an algebraic system having five-band coefficient matrix. In order to test the accuracy of the method, they have also computed the error norms L_2 and L_∞ and the three lowest invariants I_1, I_2 and I_3 and compared them with those of earlier studies. The newly obtained numerical results are found to be in good agreement with the earlier studies in the literature. Finally, they have also made the stability analysis.

Keywords: *mKdV equation; Differential quadrature method; Fourth-order Runge-Kutta Method; Stability*

Step size bounds for multiderivative Runge-Kutta methods with reduced number of function evaluations

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Abstract

Recently, the Runge-Kutta methods, obtained via Taylor's expansion is exist in the literature. In this study, we have derived a method for solving $y' = f(y)$ autonomous differential equations, by considering available Multiderivative Explicit Runge-Kutta methods. The method is created by approximating to expression y''' in Taylor series. However, we present the step size bounds for these methods. So, high precision results are obtained. To show efficiency of the method and compare the step size bounds with other some existing methods some standard problems are given.

Keywords: *Runge-Kutta method; Step-size bound; Autonomous differential equation; Multiderivative*

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Numerical solution of fractional partial differential-algebraic equations via fractional variational iteration method and multivariate Padé approximation

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Abstract

The aim of this paper is to provide approximate solution for partial differential-algebraic equations of fractional order (FPDAEs) by using multivariate Padé approximation (MPA). Firstly FPDAE has been converted into power series by fractional variational iteration method (FVIM), then the numerical solution of equation has been obtained as Multivariate Padé series form. To show effectiveness of the proposed methods, an application is presented. Fractional derivative is described in the Jumarie sense. Thus we get numerical solution of FPDAE.

Keywords: *Partial differential-algebraic equation; Fractional partial differential-algebraic equation; Fractional variational iteration method; Multivariate Padé approximation; Modifier Riemann-Liouville derivative*

The finite difference approximations of the optimal control problem for stationary equation of Quasi-Optic

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Abstract

In this paper, the finite difference method is applied to the optimal control problem of system governed by stationary equation of Quasi-Optic. For this aim, the finite difference scheme is constituted for considered optimal control problem. Obtained an estimation for the solution of this difference scheme, the error of the difference scheme is evaluated. Finally, the convergence according to the functional of the finite difference approximations is proved.

Keywords: *Optimal control; Quasi-Optic; Finite difference method*

Exact soliton solutions of the generalized Drinfel'd-Sokolov equation

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Abstract

Drinfel'd-Sokolov equation with generalized evolution is studied in this paper using the new development, the functional variable method. We derived the exact soliton solutions for the considered model. A new parametric restriction for the existence of these soliton solutions is obtained. The physical parameters (amplitude, inverse width and velocity) in the solitary wave solutions are obtained as functions of the varying model coefficients.

Keywords: *Drinfel'd-Sokolov equation; Functional variable; Generalized evolution*

Some sequence spaces and matrix transformations in multiplicative sense

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Abstract

In this paper, based on multiplicative calculus matrix transformations in sequence spaces are studied and characterized. Also, we give a brief introduction to $*$-summability based on multiplicative type addition (or just multiplication) and give some multiplicative dual $*$-summability methods using $*$-Stieltjes integral and multiplicative differentiation under the $*$-integral sign.

Keywords: *Multiplicative calculus; Non-Newtonian calculus; Matrix transformations; Sequence spaces*

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A neural mechanism of spontaneous alternation

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Abstract

Spontaneous alternation (SA) is defined as increased possibility to choose different location (choice) other than explored before, on subsequent trials. From single cell organisms to human SA can be observed. Generally the potential to alternating choices is related to remembering its previous choice but underlying mechanism of SA is not clear [1]. SA used as rapid and simple test of memory by behavioral pharmacologists since animals must remember last choice to alternate it [2]. In this work, we introduce a simple neural model SA that is mainly utilizing calcium-dependent potassium currents(AHP)[3] to differentiate between possible choices.

Keywords: *After hyperpolarization; Spontaneous alternation; Memory*

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Existence of global solutions for a nonlinear evolution equation

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Abstract

We characterize the global solutions of a nonlinear evolution equation in case of high energy initial data. We use the potential well method, we define a new functional and prove the existence of global solutions by use of sign invariance of this functional.

Keywords: *Evolution equation; Potential well; Global solution*

Motions of curves in the pseudo-Galilean space $\mathbb{G}_3^1$

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Abstract

In this article we study the flows of curves in the pseudo-Galilean 3-space and its equiform geometry without any constraints. We find that the Frenet equations and intrinsic quantities of the inelastic flows of curves are independent of time. We show that the motions of curves in the pseudo-Galilean 3-space and its equiform geometry are described by the inviscid and viscous Burgers' equations.

Keywords: *Pseudo-Galilean geometry; Equiform geometry; Motions of curves; Inextensible flows; Burgers' equation*

Motions of curves on quadrics in Minkowski 3-space

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Abstract

In this study we investigate the evolutions of curves on quadrics in Minkowski 3-space by means of compatibility conditions of moving frames. We give the flow equations of these evolutions and some related nonlinear partial differential equations using some special frame for the curves on the *pseudosphere* S_1^2, the *pseudohyperbolic* H_0^2 and the *lightcone* LC in Minkowski 3-space.

Keywords: *Motions of curves; Sabban Frame; Generalized of the Korteweg-de Vries*

Motions of curves in the Galilean space $\mathbb{G}_3$

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Abstract

In this paper, we study the flows of curves in the Galilean 3-space and its equiform geometry without any constraints. We find that the Frenet equations and the intrinsic quantities of the inelastic flows of curves are independent of time. We show that the motion of curves in the Galilean 3-space and its equiform geometry are described by the inviscid and viscous Burgers' equations.

Keywords: *Galilean geometry; Equiform geometry; Motions of curves; Inextensible flows; Burgers' equation*

Tripotency of linear combinations of four involutory matrices that mutually commute

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Abstract

A complete solution is established for the problem of characterizing all situations wherein a linear combination of the form $T = c_1T_1 + c_2T_2 + c_3T_3 + c_4T_4$ is a tripotent matrix when T_1, T_2, T_3, and T_4 are commutative involutive matrices. This solution is based mainly on the theory of systems of linear equations and block technique of matrices. Our systematic approach to the solution of the problem considered makes it possible to solve other such problems easily.

Keywords: *Tripotent matrix; Involutive matrix; Commutativity; Diagonalization; Linear equations system; Direct sum of matrices*

Structure of the lightlike hypersurfaces along spacelike submanifolds

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Abstract

In the light of the construction method of the lightlike hypersurfaces along spacelike submanifolds, the authors give a relation between the second fundamental forms of the screen distribution and the submanifold. They give the conditions for such a lightlike hypersurface to be screen conformal.

Keywords: *Lightlike hypersurface; Spacelike submanifold; Screen distribution*

On the two-orthogonal polynomials generated by a relation with two terms

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Abstract

In this work we are interested in the study of **regeneration** and **decomposition** of monic 2-orthogonal polynomials satisfying the relation

$$Q_{n+1}(x) = P_{n+1}(x) + \alpha_{n+1}P_n(x), n \geq 0, \text{ where } \alpha_n \in \mathbb{C} \qquad (1)$$

we say that the sequence $\{Q_n\}_{n\geq 0}$ is the α_n-generated with 2 terms of the sequence $\{P_n\}_{n\geq 0}$ and the sequence $\{P_n\}_{n\geq 0}$ is the α_n-decomposed with 2 terms of the sequence $\{Q_n\}_{n\geq 0}$.

We started first, by the characterization of these sequences from the coefficients of their respective recurrences, then we have shown the existence of a large family of polynomials satisfying the relation (1).

We also show that if $U = (u_0, u_1)^t$ and $V = (v_0, v_1)^t$ are two regular vector functional associated respectively with the sequences $\{P_n\}_{n\geq 0}$ and $\{Q_n\}_{n\geq 0}$ these functional are related by the vectoriel relationship

$$\begin{pmatrix} u_0 \\ u_1 \end{pmatrix} = \begin{pmatrix} 0 & \lambda \\ x - \mathbf{x} & 0 \end{pmatrix} \begin{pmatrix} v_0 \\ v_1 \end{pmatrix}$$

We give then, many examples edifying of 2-orthogonal polynomials sequences; we show with these examples that there are a least four types of sequences namely:

- Sequences α_n-generated and α_n-decomposed with finite number of sequences,
- Sequences α_n-generated and α_n-decomposed with infinite number of sequences,
- Sequences α_n-auto-generated,
- Sequences clones,
- Sequences multiples clones

Keywords: *Orthogonal polynomial; Generated polynomial; Decomposed polynomial; Finite relation*

Voronovskaya type theorem with q-derivatives on unbounded sets

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Abstract

In this talk, we present Voronovskaya type result for q-derivative of q-Baskakov operators for the functions in polynomial weighted space. Our results allow us to obtain Voronovskaya theorem for Baskakov operators for the functions being uniformly continuous and differentiable at $x = 0$ as classical, although the classical one is valid for differentiable functions.

Keywords: *q-Baskakov operators; Voronovskaya-type theorem; q-derivative*

On the Kantorovich modification of Baskakov-Durrmeyer operators

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Abstract

In this talk, we introduce a new generalization of Baskakov operators for the functions being integrable on unbounded intervals. We achieve to combine the main methods of Kantorovich and Durrmeyer for Baskakov operators simultaneously. We investigate weighted approximation properties of these new operators. Rate of pointwise convergence of the operators by the means of appropriate modulus of continuity is obtained as well. The last section is also devoted for the direct results for the functions belonging to $L_p[0,\infty)$.

Keywords: *Integral type operators; Durrmeyer Operators; Kantorovich operators; Weighted approximation*

Perfect Discrete Morse Functions on Connected Sums

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Abstract

Since it was introduced by Marston Morse in the 1920s, Morse theory has been a powerful tool in the study of smooth manifolds. It allows one to describe the topology of a manifold in terms of the cellular decomposition generated by the critical points of a smooth map defined on it.

In the 1990s Robin Forman developed a discrete version of Morse theory that turned out to be an efficient method for the study of the topology of discrete objects, such as simplicial complexes. A discrete Morse function on a simplicial complex is a way to assign a real number to each simplex, without any continuity. As in the smooth setting, changes in the topology are deeply related to the presence of critical simplices of the function.

In this talk, we will briefly review the notion of a perfect discrete Morse function, most suitable functions for combinatorial purposes, then discuss perfect discrete Morse functions on connected sums of triangulated manifolds.

Keywords: *Discrete Morse theory; Simplicial complex; Perfect discrete Morse function*

Some results on the generalized recurrent manifolds

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Abstract

In this paper we study generalized recurrent manifolds with some additional conditions. We investigate their Ricci tensor and show that these manifolds are quasi Einstein in some cases.

Keywords: *Generalized recurrent manifold; Quasi Einstein; Kenmotsu manifold*

New sequence spaces defined by matrices product on paranormed spaces

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Abstract

By using generalized weighted mean and difference operator of order m, we introduce some new generalized sequence spaces related to the spaces $\ell_\infty(p)$; $c(p)$ and $c_0(p)$, and to investigate some topological properties. Also we determine the $\alpha-$, $\beta-$ and $\gamma-$ duals of those spaces and some matrix transformations.

Keywords: *Paranormed sequence space; Difference operator of order m; Bases for sequence space; Matrix transformation*

Some singular value inequalities for positive semidefinite matrices

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Abstract

Recently, a number of inequalities are established by many authors. In this presentation, we will give some basic notation about Heinz mean, majorization and positive semidefinite matrices. We will provide an overview of majorization applications and we will mention existing some matrix ineqaulity related majorization. Having compared some appering results in the literature, we present some improvement of Heinz inequality via majorization.

Keywords: *Heinz Means; Positive Semidefinite Matrix; Unitarily Invariant Norm; Majorization*

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