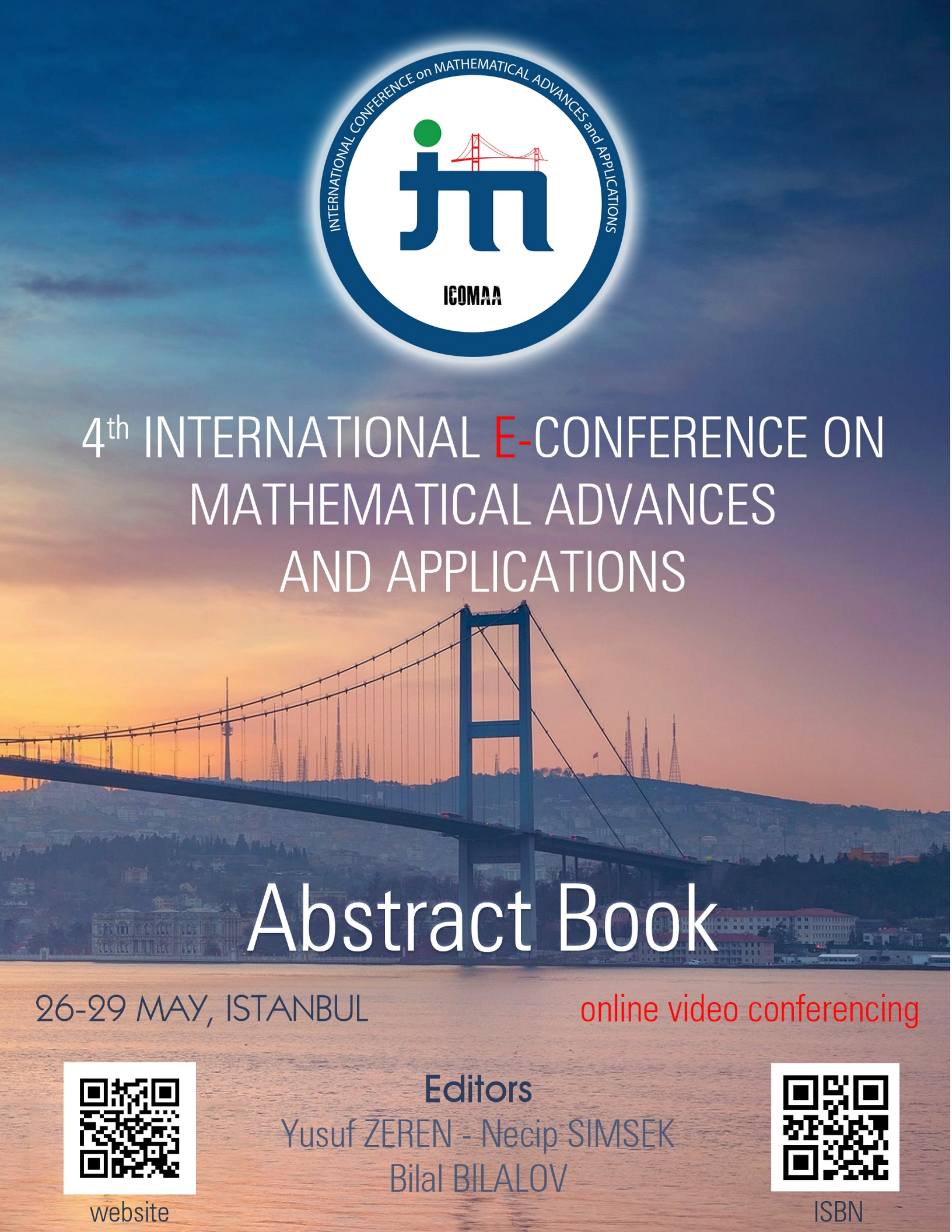

4th INTERNATIONAL E-CONFERENCE ON MATHEMATICAL ADVANCES AND APPLICATIONS

Abstract Book

26-29 MAY, ISTANBUL

online video conferencing

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Editors

Yusuf ZEREN - Necip SIMSEK

Bilal BILALOV

ISBN

4th INTERNATIONAL E-CONFERENCE ON MATHEMATICAL ADVANCES AND ITS APPLICATIONS

MAY, 26-29, 2021, ISTANBUL / TURKEY

Abstract Book

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ICOMAA-2021

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FOREWORDS

Dear Conference Participant,

Welcome to the International E-Conference on Mathematical Development and Applications (ICOMAA-2021) we organized the fourth. The aim of our conferences is to bring together scientists and young researchers from all over the world and their work on the fields of mathematics and applications of mathematics, to exchange ideas, to collaborate and to add new ideas to mathematics in a discussion environment. With this interaction, functional analysis, approach theory, differential equations and partial differential equations and the results of applications in the field of Mathematics are discussed with our valuable academics, and in mathematical developments both science and young researchers are opened. We are happe to host many prominent experts from different countries who will present the state-of-the-art in real analysis, complex analysis, harmonic and non-harmonic analysis, operator theory and spectral analysis, applied analysis.

I would like to express my gratitude to those who see and appreciate our efforts and innovative steps that we have made to improve our conference every year, to our dear invited speakers and to all our participants. I owe a debt of gratitude to the Scientific committee, organizing committee, local organizing committee and for their efforts throughout this conference series.

The conference brings together about 175 participants and 11 invited speakers from 27 countries (Algeria, Albania, Azerbaijan, Canada, China, Colombia, Cyprus, Czech Republic, Finland, Germany, Greece, India, Iran, Italy, Kuwait, Malaysia, Morocco, Pakistan, Qatar, Saudi Arabia, Thailand, Tunisia, Turkey, United Arab Emirates, USA, Uzbekistan, Yemen).

More than 50% of our participants participated from abroad. This shows that the conference meets the criteria of being international.

It is also an aim of the conference to encourage opportunities for collaboration and networking between senior academics and graduate students to advance their new perspective. Additional emphasis on ICOMAA-2021 applies to other areas of science, such as natural sciences, economics, computer science, and various engineering sciences, as well as applications in related fields. The articles submitted to this conference will be addressed on the conference web sites and in the journals listed below:

- Miskolc Mathematical Notes,
- Azerbaijan Journal of Mathematics,
- Sigma Journal of Engineering and Natural Sciences,
- Istanbul Commerce University Journal of Sciences,
- Transactions Issue Mathematics.

This booklet contains the titles and abstracts of almost all invited and contributed talks at the **4th International E-Conference on Mathematical Advances and Applications**. Only some abstracts were not available at the time of printing the booklet. They will be made available on the conference website http://2021.icomaas.com/ when the organizers receive them.

We wish everyone a fruitful conference and pleasant memories throughout the online conference.

Assoc. Prof. Yusuf ZEREN
On Behalf of Organizing Committee
Chairman

It was a big excitement moment when Assoc. Prof. Yusuf ZEREN discussed with me on the issue of "4th International Mathematical Developments and Applications Conference" (ICOMAA-2021) in Yıldız Technical University, Istanbul. It is a great pleasure that this conference is going to take place now. As one of the organizers of the conference, I am delighted with all the delegates, distinguished mathematicians, speakers and young researchers in this international event. It is expected that delegates and participants will benefit from this conference experience and the legacy of information dissemination will continue.

I wish all of you to have a nice and enjoyable participation in the conference.

Prof. Necip SIMSEK

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CONTENTS

INVITED TALKS

Compact embeddings for variable exponent Sobolev and Lebesgue spaces

Amiran Gogatishvili

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Let Ω be an open subset of R^N, and let $p, q: \Omega \to [1, \infty)$ be measurable functions. We give a necessary and sufficient condition for the embedding of the variable exponent space $L^{p(\cdot)}(\Omega)$ in $L^{q(\cdot)}(\Omega)$ to be almost compact. This leads to a condition on Ω, $p(\cdot)$ and $q(\cdot)$ sufficient to ensure that the Sobolev space $W^{1,p(\cdot)}(\Omega)$ based on $L^{p(\cdot)}(\Omega)$ is compactly embedded in $L^{q(\cdot)}(\Omega)$. Compact embedding results of this type already in the literature are included as special cases.

Keywords: almost-compact embeddings, Banach function spaces, variable Lebesgue spaces, variable Sobolev spaces

2020 Mathematics Subject Classification: 46E30, 26D15

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The author was supported by the grant P201-18-00580S of the Grant Agency of the Czech Republic and RVO:67985840

Solvability problems of elliptic equations in non-standard function spaces

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Abstract

In this work some information on non-standart spaces is given. Some results concerning the questions of extension of functions from grand-Sobolev spaces and compactness regarding these classes are presented, a notion of the trace of a function in the grand-Sobolev space on an $(n-1)$-dimensional piecewise-differentiable surface is define and the corresponding theorems concerning traces, extensions, and compactness of a family of functions from $N^k_{q)}(\Omega)$ are proved. These results are applied to obtain a Schauder-type estimate up to the boundary for a second-order elliptic operator with nonsmooth coefficients. In grand-Lebesgue and grand-Sobolev spaces the embedding theorems are proved and Riesz type potentials and their properties are also established. With help of the established estimates the question of the solvability (in the strong sense) of the Dirichlet problem for a second-order elliptic type equation in classes $N^2_{q)}(\Omega)$ is solved.

Keywords: Grand-Lebesgue, Grand-Sobolev spaces, Dirichlet problem, elliptic equation, Schauder-type estimates, Fredholmness, Riesz type potentials

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4. Bilalov B.T., Sadigova S.R. On the Fredholmness of the Dirichlet problem for a second-order elliptic equation in grand-Sobolev spaces. Ricerche di Matematica (accepted)

[1] This work is supported by the Scientific and Technological Research Council of Turkey (TUBITAK) with Azerbaijan National Academy of Sciences (ANAS), Project Number: 19042020 and by the Science Development Foundation under the President of the Republic of Azerbaijan – Grant No. EIF-BGM-4-RFTF1/2017- 21/02/1-M-19

Necessary conditions for two-weight, weak-type inequalities for linear and multi-linear Caldero´n-Zygmund singular integral operators

David Cruz-Uribe,
OFS
The University of Alabama

Abstract: It is now a well-known result that given $1 < p < \infty$, and a linear Calderon-Zygmund singular integral operator (CZO) T with kernel representation

$$Tf(x) = \int_{\mathbb{R}^n} K(x,y)f(y)dy,\ x \notin \operatorname{supp}(f),$$

if w is in the Muckenhoupt class A_p, then T satisfies the one-weight, weak-type inequality

$$w(\{x \in \mathbb{R}^n : |Tf(x)| > t\}) \leq \frac{C}{t^p}\int_{\mathbb{R}^n} |f(x)|^p w(x)\,dx.$$

Conversely, the A_p condition is "almost" necessary. It was first shown that if this weak type inequality is true for T equal to each of the Riez transforms, then $w \in A_p$. Later, Stein showed that if this inequality is true for just one of the Riesz transforms, or more generally for any CZO whose kernel satisfies a non-degeneracy condition, then $w \in A_p$.

We have extended these results to the two weight setting and show that in the presence of a weak doubling condition, if T satisfies

$$u(\{x \in \mathbb{R}^n : |Tf(x)| > t\}) \leq \frac{C}{t^p}\int_{\mathbb{R}^n} |f(x)|^p v(x)\,dx,$$

then $(u,v) \in A_p$. We also extend this result to pairs of measures (μ,ν). Building upon work of Lacey, Sawyer and Uriarte-Tuero, we also consider necessary conditions for the weak-type inequality

$$\mu(\{x \in \mathbb{R}^n : |T_\sigma f(x)| > t\}) \leq \frac{C}{t^p}\int_{\mathbb{R}^n} |f(x)|^p\,d\nu,$$

where (μ,σ) are measures and $T_\sigma f(x) = T(f\sigma)(x) = \int K(x,y)d\sigma(y)$.

In our talk we will state our results and sketch the key elements of the proof. We will also discuss the corresponding results for multi-linear CZOs,

$$T(f1,\ldots,fm)(x) = \int_{\mathbb{R}^{nm}} K(x,y1,\ldots,ym)f1(y1)\cdots fm(ym)dy1\ \cdots dym.$$

Our work generalizes the one-weight results of Lerner, Ombrosi, P´erez, Torres, and Trujillo-Gonz´alez.

All of this research is joint with John-Oliver MacLellan (University of Alabama).

On physical and geometrical meaning of the fractional operators: a point of view

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[2]*Institute of Space Sciences, Magurele-Bucharest, Romania*

Abstract

Fractional calculus is an emerging field of mathematics having several applications in more than 100 fields of science and engineering. Physical and geometrical meaning of fractional calculus operators are still one of the open problems of fractional calculus despite few reported results. In my talk I will consider the mechanism of a memory effect based on linear or nonlinear systems of balance equations and we discuss several consequences.

On existence of positive solution for a class of nonuniformly elliptic equation

Farman Mamedov
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Abstract

Our talk relates, to the solvability of Dirichlet problem for a class of semilinear elliptic equations with principal part is second order divergence structure linear operator of $N = n + m$ variables, namely

$$\frac{d}{dz_i}\left(a_{ij}(z)\frac{du}{dz_j}\right) + v(x)u^{q-1} = 0$$

where the coefficients $a_{ij}(z), 1 \leq i, j = \overline{1,N}$ are measurable functions on a domain Ω in Euclidean $N = n + m$ space $\mathbb{R}^N$. Let there exist positive constants C_1, C_2 such that

$$C_1(\omega(x)|\xi|^2 + |\eta|^2) \leq a_{ij}(z)\zeta_i\zeta_j \leq C_2(\omega(x)|\xi|^2 + |\eta|^2)$$

for all $\zeta = (\xi, \eta) \in \mathbb{R}^{n+m}$ with $\xi \in \mathbb{R}^n, \eta \in \mathbb{R}^m$.

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Fourth order pq-Laplacian

Jan Lang[1]
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Abstract

Motivated by study of the higher order Sobolev embeddings on interval and their approximation we introduce and study a non-linear pq-biharmonic eigenvalue problem on the unit segment subject to Navier boundary condition. We will disuse existence of periodic symmetric solutions. In the case p, p0 we show that all eigenvalues and eigenfunctions can be expressed in terms of generalized trigonometric functions.

On the Sobolev stability of the L^2 projections

Lars Diening
Bielefeld University

Abstract

The L 2 -projection to the space of Lagrange finite elements is a fundamental tool in the numerical analysis. It is in particular of importance for the study of parabolic problems. To analyze these problems it is necessary to use the stability of the L 2 -projection with respect to the Sobolev space W1,2 . Indeed, it was shown recently that the equivalence of the discretization error and the best approximation error in terms of function spaces is equivalent to the Sobolev stability of the L 2 -projection. The Sobolev stability is easily proved for quasi-uniform meshes, but is very difficult to obtain for locally refined meshes. In this talk I will present new results on the Sobolev stability of the L 2 -projection in 2D and 3D for arbitrary degree of the polynomials. This is a joint work with Johannes Storn and Tabea Tscherpel from Bielefeld University (Germany).

Elliptic and Parabolic Systems with VMO Coefficients in Generalized Morrey Spaces

Lubomira Softova[1] and Dian Palagachev[2]
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Abstract

We obtain the Calderon-Zygmund type estimates in generalized Morrey spaces for strong solutions to 2b-order linear elliptic and parabolic systems with discontinuous principal coefficients.

Keywords: Generalized Morrey spaces, VMO coefficients, Singular integrals, Calderon-Zygmund type estimates, strong solutions.

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Norm-based robust solutions in vector optimization

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[2]Department of Computer Engineering, Shahr-e-Qods Branch,
Islamic Azad University, Tehran, Iran

Abstract

In this talk, norm-based robust efficiency, in general vector optimization, is discussed. After highlighting the differences between robustness, stability and sensitivity analysis, the connections between norm-based robustness and other robust solution concepts are addressed. The relationships between the robustness and strict/proper/isolated efficiency are investigated. A full characterization of norm-based robust efficient solutions in terms of the tangent cone of the feasible set and Clarke's generalized Jacobian is provided. The last part of the presentation focuses on the special cases, including the linear one. Some solution concepts devoted to these cases are introduced and discussed.

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Double phase and generalized Orlicz models for image restoration

Peter Alexander Hästö
University of Turku,

Abstract

In this talk I present results from a recent paper with Petteri Harjulehto (JMAA, 2021) and ongoing work with him and Michela Eleuteri. In our article, we explored the potential of the double phase functional in an image processing context. We studied minimizers of the double phase energy for functions with bounded variation and showed that this energy can be obtained by Γ-convergence or relaxation of regularized functionals. In ongoing work, we generalize these results to the generalized Orlicz setting.

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Formalization of Information Theory in Higher-Order Logic Theorem Proving

Sofiene Tahar
Concordia University

Abstract

Information theory is widely used for analyzing a wide range of scientific and engineering problems, including cryptography, neurobiology, quantum computing, plagiarism detection and other forms of data analysis. Despite the safety-critical nature of some of these applications, most of the information-theoretic analysis is done using informal techniques, mainly computer simulation and paper-and-pencil analysis, and thus cannot be completely relied upon. The unreliable nature of the produced results poses a serious problem in safety-critical applications and may result in heavy financial losses or even the loss of human life.

In order to overcome the inaccuracy limitations of these techniques, this work proposes to conduct the analysis within the trusted kernel of a higher-order-logic (HOL) theorem prover. For this purpose, we provide HOL formalizations of the fundamental theories of measure, Lebesgue integration and probability and use them to formalize some of the most widely used information-theoretic principles.

We use the Kullback-Leibler (KL) divergence as a unified measure of information which is in turn used to define the main measures of information like the Shannon entropy, mutual information and conditional mutual information. Furthermore, we propose two new measures of information leakage, namely the information leakage degree and the conditional information leakage degree and compare them with the existing ones.

We illustrate the usefulness of the proposed framework by tackling various applications including the performance analysis of a typical encoder which is used in the proof of the Shannon source coding theorem, the quantitative analysis of privacy properties of an anonymity-based MIX channel and the one-time pad encryption system using information-theoretic measures.

CONTRIBUTED TALKS

Error Estimates of Spectral-Galerkin Method in Jacobi-Weighted Sobolev Spaces for Non-local Boundary Problems.

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Abstract

In this work, we consider the approximation for a class of non-local boundary problems for partial differential equations by Galerkin-type spectral methods. Using Jacobi approximations in non-uniformly Jacobi-weighted Sobolev spaces, some error estimates of the Galerkin spectral method are established. The results presented in this paper are an improvement of those derived in the work [1], in which optimal error estimates are obtained in the usual functional framework.

Keywords: Spectral method, Galerkin method, Error estimate, Jacobi polynomials, Jacobi-weighted Sobolev spaces.

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Certain results on a new family of Fubini-type polynomials

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Abstract

This article aims to introduce a new family of hybrid special polynomials, namely the generalized Fubini-type polynomials of the parametric kind. The generating functions, differential equations, and other properties for these polynomials are established within the context of the monomiality principle. Using the generating functions, various interesting identities and relations related to the generalized Fubini-type polynomials are also derived. Further, we obtain certain partial derivative formulae including the generalized Fubini-type polynomials. In addition, certain members belonging to these polynomials are considered.

Keywords: Fubini-type polynomials; 2-variable general polynomials; Generating function; Apostol-type polynomials.

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The Simple Proof of Regularity of the Boundary Point with Respect to the Dirichlet Problem for Heat Equation in the Symmetric Domains

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In the symmetric domain

$$D_H = \{(x,t): -H < t < 0, |x|^2 < -t \cdot \alpha(-t), H > 0\} \subset R^{n+1}$$

we are considering the Dirichlet problem for the heat equation:

$$u_t(x,t) = \Delta u(x,t), \quad (x,t) \in D_H \tag{1}$$

$$u|_{\partial D_H} = f(x,t) \in C(\partial D_H) \tag{2}$$

and in the capasity terms obtain a "geometric" characterization of regular boundary point $(0,0) \in \partial D_H$,where the function $\alpha(z) > 0$ is nonincreasing continuous and the fuction $z\alpha(z)$ as $z \to 0+$ monotonically decreasing convergent to zero.

Let $F(x,t) = \begin{cases} (4\pi t)^{-n/2} exp\,[-|x|^2/4t], t > 0, \\ 0, \qquad\qquad t \le 0 \end{cases}$ is the fundamental solution of the heat equation and define

$$E_m = \left\{(4\pi e^{-m})^{-n/2} \le F(-x,-t) \le \left(4\pi e^{-(m+1)}\right)^{-n/2}\right\}.$$

Lemma. Let $z_m \in (0, e^{-m})$ is the root of the equation $2\pi \ln\left(\frac{e^{-m}}{z}\right) = \alpha(z)$. Then there exists positive constants C_1 and C_2 which is depending only on n such that

$$C_1(n) \le \frac{cap(z_m \cap D_H^c)}{(z_m \ln(e^{-m}/z_m))^{\frac{n}{2}}} \le C_2(n),$$

where $cap(K)$ denote the thermal capacity of compact subset $K \subset R^{n+1}$ and $D_H^c = R^{n+1} \backslash D_H$. [1,2]

Theorem. A point $(0,0) \in D_H$ is regular with respect to the Dirichlet problem (1),(2) if and only if $\sum_{m=1}^{\infty} \left(\frac{z_m}{e^{-m}} \ln\left(\frac{e^{-m}}{z_m}\right)\right)^{n/2} = \infty$.

An equivalent condition is $\sum_{m=1}^{\infty} e^{\frac{mn}{2}} cap(D_H^c \cap E_m) = \infty$.

Keywords: Dirichlet problem, symmetric domain, heat equation, capacity

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Anisotropic elliptic systems with non standard growth

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Abstract

In this talk, we discuss the solvability of a strongly nonlinear elliptic systems in the framework of Sobolev spaces with anisotropic variable exponents. We prove the existence of a couple of entropy solutions for a source L^1 and without assuming any condition on the behavior of the solutions when x tends towards infinity.

Keywords: Elliptic systems, Sobolev spaces with variable exponent, Entropy solutions, Unbounded domain.

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Reconstruction of the characteristic function of the boundary value problem of the Dirac operator in the form of an infinite product

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Abstract

In this work, considers reconstruction using the eigenvalues of the characteristic function of the Dirac boundary value problem with nonseparated boundary conditions, one of which contains the spectral parameter of the linear function. Reconstruction of the characteristic function in the form of an infinite product plays an important role in solving inverse problems of spectral analysis for the Dirac system.

Keywords: Dirac operator, nonseparated boundary conditions, eigenvalues, infinite product.

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E-exact Sequence and Some Results

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Abstract

Let R be a commutative ring and E an R-module. In this note, we present the concept the characterization of $e-$ homotopy and $e-$ resolution with some results.

Keywords: E-exact sequence, E-homotopy , E-injective module, Hom(-,E) functor, Homolojical algebra

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U-exact Sequence and Some Results

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Abstract

Let $\mathbb{R}$ be a commutative ring with identity and $\mathbb{M}$ an unital $\mathbb{R}$-module. In this note, we present the definition $\mathbb{U}$-projective module and $\mathbb{U}$-injective module with some results. Our main goal is to give the relation between $\mathbb{U}$-projective module and respectively $\mathbf{Hom}(\mathbf{M},-)$ functor, free module and $\mathbb{U}-\mathbf{exact\ sequence}$, similarly between $\mathbb{U}$ –injective modules and respectively $\mathbf{Hom}(-,\mathbf{M})$ functor, divisible group and $\mathbb{U}-\mathbf{exact\ sequence}$ by some theorems.

Keywords: U-exact sequence, U-projective module, U-injective module, Hom(M,-) functor, Homological algebra

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New Oscillation Criteria for Damped Second-Order Linear Mixed Neutral Differential Equations

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Abstract

This talk is about to the oscillatory behavior of solutions to damped second-order linear functional differential equations with a mixed neutral term. In the beginning of the presentation, brief information will be given about the oscillatory behavior of the solutions of the functional differential equations. Afterwards some new sufficient conditions for the oscillation of solutions considered equations will be presented. The examples at the end of the talk will show the applicability of the results gained in the study.

Keywords: Oscillatory behavior, Neutral differential equations, second order.

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On fixed point theorem for systems of fractional differential equations

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Abstract

In this talk, we present some existence results for coupled systems of fractional differential equations. The system discussed under the conditions of a fixed point theorem in the generalized Banach space of the sense of Perov; $C([0,T],\mathbb{R})\times C([0,T],\mathbb{R})$ of all couple of piecewise continuous functions on $[0,T]$. Further, an example is shown to illustrate the results.

Keywords: System of fractional differential equations, fixed point theorem, Generalized Banach space, Convergent to zero matrix.

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Axisymmetric Bending Analysis of Circular Plates on Elastic Foundation

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Abstract

Axisymmetric bending response of shear deformable cylindrically orthotropic circular plates under the action of uniform transverse pressure is investigated by means of the differential transform method (DTM). Due to its simplicity, DTM has been one of the widely used numerical techniques in the solution of boundary value problems and initial value problems. Since DTM provides a series expansion, the accuracy of the results obtained by DTM depends highly on the number of terms considered in the solution. The formulation used in this computational study is based on the first order shear deformation theory (FSDT). The governing equations include three field variables which are the deflection, the horizontal radial displacement, and the rotation. Numerical simulations are performed to study the bending behavior of the plate which is in contact with a two-parameter elastic medium. The influence of the material properties, and the effect of the elastic foundation on the maximum deflection are discussed. The accuracy of the results obtained in the current study is validated through comparison study.

“This work has been supported by Yildiz Technical University Scientific Research Projects Coordination Unit under project number FYL-2021-4183”.

Keywords: Circular plate, orthotropic, DTM, FSDT, bending.

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Approximation of functions by a modified Szasz operator associated with Hermite polynomials

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Abstract

In this article, we define a Stancu-type generalization of Szasz operators associated with Hermite polynomials and investigate their convergence properties with the help of Korovkin's theorem. We discuss the approximation theorems for these operators with the aid of Peetre's K-functional, classical and second-order modulus of continuity and estimate the rate of convergence for Lipschitz-type functions. We also consider statistical approximation properties for these operators. We estimate the rate of weighted A-statistical convergence and also prove a Voronovskaja-type approximation theorem for these operators using the notion of weighted A-statistical convergence.

Keywords: Positive linear operators, Rate of convergence, Modulus of continuity, Hermite polynomials, weighted A-statistical convergence, Voronovskaja-type theorem.

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On convergence of spectral expansion in the eigenfunctions of a third-order ordinary differential operator

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Abstract

In this paper studied the convergence of spectral expansions of functions of the class $W_1^1(G)$, $G = (0,1)$, in eigenfunctions of an ordinary differential operator of third order with integrable coefficients. Sufficient conditions for absolute and uniform convergence are obtained.

Keywords: absolute and uniform convergence, eigenfunction, spectral expansion.

On the interval $\boldsymbol{G = (0,1)}$ consider the differential operator

$$\boldsymbol{Lu = u^{(3)} + P_2(x)u^{(1)} + P_3(x)u}$$

with coefficients $\boldsymbol{P_l(x) \in L_1(G), l = 2,3}$.

Let $\{\boldsymbol{u_k(x)}\}_{\boldsymbol{k=1}}^{\boldsymbol{\infty}}$ be a complete orthonormal system in $\boldsymbol{L_2(G)}$ consisting of eigenfunctions of the operator $\boldsymbol{L}$, and let $\{\boldsymbol{\lambda_k}\}_{\boldsymbol{k=1}}^{\boldsymbol{\infty}}$ be the corresponding system of eigenvalues, $\boldsymbol{Re\lambda_k = 0}$ ([1], [2]).

We prove the following result.

Theorem. If the function $\boldsymbol{f(x) \in W_1^1(0,1)}$ satisfies the relations $\boldsymbol{f(0) = f(1) = 0}$ and $\boldsymbol{f'(x) \in H_1^\alpha(0,1), 0 < \alpha \leq 1}$, $\boldsymbol{(H_1^\alpha(0,1)}$ is the Nikolski class), then its spectral expansion converge absolute and univormly on the interval $\boldsymbol{\overline{G} = [0,1]}$.

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Minimizing Total Completion Time for Stochastic Flowshops

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Abstract

We study the flowshop scheduling problem to minimize total completion time in stochastic environments where processing times are modelled to be as stochastic variables with some lower and upper bounds. This is the only information available to us about job processing times. When we have enough information about some jobs, their lower and upper bounds on processing times would be close to each other. However, for some other jobs, when we do not have enough information, their lower and upper bounds on processing times would be far from each other. But for both cases, job processing times would be between the lower and upper bounds. Minimizing total completion time objective function is critical in environments where inventory cost is of the main concern. Given that the addressed problem is known to be Np-hard in the scheduling literature, we propose several algorithms to solve the problem. The algorithms assigns different weights to the processing times on different machines. Extensive computational experiments are conducted to compare the performances of the proposed algorithms. Problem sets are randomly generated by using several extreme distributions. The computational results indicate that three algorithms are superior to the other algorithms for all considered distributions. This is confirmed by constructing statistical confidence intervals

Keywords: Flowshop, total completion time, algorithm, stochastic processing times

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Blow-up solutions of mixed problem for a nonlinear one-dimensional wave equation with variable-exponent nonlinearities, dynamical transmission condition and boundary damping

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Abstract

We study a mixed problem with nonlinear dissipative boundary conditions for systems of one-dimensional semilinear wave equations with a focusing nonlinear source that has a variable growth exponent. Theorems on the blow-up of solutions in finite time are proved.

Keywords:semilinear, wave equationblow-up, variable exponents, focusing nonlinear source, transmission conditions.

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Evaluating Lie mappings on some algebras

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Abstract

A linear map : → is called Lie centralizer if [,] = [( ),] for all , ∈ , when is a generalized matrix algebra. A proper Lie centralizer is of the form ( ) = + ( ) where ∈ ( ) and ( ) ⊂ ( ). In this talk, we study Lie centralizer on generalized matrix algebras when , ∈ are orthogonal and in sequel, we conclude some results of [1, 2, 3, 4, 5].
At last, is is deduced corollaries for triangular algebras and full matrix algebras.

Keywords: Lie centralizer mapping, generalized matrix algebras, proper maps.

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Investigation of Natanson Type Integral Inequalities

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Abstract

The lemma given by I.P. Natanson (1950) as an answer to the representation problem of an integrable function at characteristic points was generalized by various authors and used in applications in singular integral theory. In this presentation, we will focus on Stanislaw Siudut's work by reviewing Natanson's integral inequality and generalized cases.

.

Keywords: Natanson's Lemma, integral inequalities, singular integral

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On the Unboundedness of Littelwood-Paley g_λ^* associaated with Bessel differential operator in $L^2_{2\alpha+1}(\mathbb{R}^n_+)$ for $\lambda \le \alpha+1$

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Abstract

Let $n \ge 2$ and g_λ^* be the operator defined by

$$g_\lambda^*(f) = \left(\iint_{\mathbb{R}^{n+1}_+} \left(\frac{t}{t+|x-z|} \right)^{n\lambda} |\psi_t * f(y)|^2 \frac{dydt}{t^{n+1}} \right)^{1/2}, \qquad (1)$$

where $\psi_t(x) = t^{-n}\psi(\frac{x}{t})$, and ψ is Littelwood-Paley function**.** It is well-known that the weak (1,1) and weak (p, p) boundedness of the classical g_λ^* function with Poisson kernel were studied by Stein [1] and Fefferman [2], respectively. Also, Fefferman show that this operator for $\lambda \le \frac{2}{p}$ could never belong to $L^p(\mathbb{R}^n)$. For the more generalized g_λ^* function defined by (1), the L^p boundedness is also well known (see for example, [3, pp. 309–318]). In this work, we define $g^*_{B,\lambda}$ associaated with Bessel differential operator and show the $g^*_{B,\lambda}$ operators are not bounded in $L^2_{2\alpha+1}(\mathbb{R}^n_+)$ for $\lambda \le \alpha+1$.

Keywords: Littlewod-Paley function, g_λ^* function, Bessel differential operator.

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Variable-Coefficient Fractional Differential Equations and their Solutions

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Abstract

We consider linear fractional differential equations with variable coefficients, in various fractional settings with different operators. A new analytical method has recently emerged for solving such equations, based on the Banach fixed point theorem and the method of successive approximations, and yielding an explicit unique solution given by a uniformly convergent infinite series.

The form of this infinite series is rather cumbersome, but it can be simplified using combinatorial methods, to find a representation of the solution as a series of fractional integrals, with coefficients given in terms of the coefficients of the original fractional differential equation.

Keywords: fractional differential equations; analytical solutions; series solutions; classes of fractional operators; fixed point theory.

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The Dynamical Scenarios of a Combination of Holling Type Functions

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Abstract

I will investigate a system, which is a feasible model in population dynamics with the Holling type functions. The results that I obtain in this paper imply that when the system has period-two solutions, which are locally asymptotically stable, saddle points or non-hyperbolic points of the stable type, and then every solution converges to either an equilibrium solution or to period-two solutions. I will also give some dynamical scenarios and theirs numerical values and visual illustrations.

Keywords: Allee effect, basin, cooperative map, invariant manifold, stable manifold

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On stability of bases from perturbed exponential systems in Orlicz spaces

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Abstract

In this work, perturbed expotensial system $\{e^{i\lambda_n t}\}_{n\in Z}$ (where $\{\lambda_n\}$ is some sequence of real numbers) is considered in the Orlicz space $L_M(-\pi;\pi)$. We find a condition on the sequence $\{\lambda_n\}$, which is sufficient for the above system to form a basis for $L_M(-\pi;\pi)$. We establish an analogue of classical Levinson theorem on the replacement of a finite number of elements of this system by other elements. Our result are the analogues of the corresponding results obtained for Lebegue spaces $L_P, 1 \le p \le +\infty$.

Keywords: Orlicz space, Levinson theorem, basicity
Classification 2010: 33B10. 46E30. 54D70

Theorem. Suppose that the N-function $M(u)$ satisfies the Δ_2- condition. Let $M(\cdot)$,$M^*(\cdot)$ be N-functions complementary for each other and the numbers α_M and β_M are upper and lower Boyd indecies for the Orlicz space L_M. Let $\{\lambda_n\}_{n\in Z}$;$\{\mu_n\}_{n\in Z} \subset R$ be some sequences,$\lambda_i \neq \lambda_j$, $\mu_i \neq \mu_j$ for $i \neq j$. Let

$$\sum_{n=-\infty}^{n=+\infty} |\lambda_n - \mu_n|^\gamma < +\infty$$

where $\gamma = \min\left(\frac{1}{\beta_M};\frac{1}{\beta_{M^*}}\right)$, $\alpha_M + \beta_{M^*} \equiv 1, \alpha_{M^*} + \beta_M \equiv 1$.

İf the system $\{e^{i\lambda_n x}\}_{n\in Z}$ forms a basis for $L_M(-\pi;\pi)$, equivalent to the basis $\{e^{inx}\}_{n\in Z}$, then the system $\{e^{i\mu_n x}\}_{n\in Z}$ also forms a basis for $L_M(-\pi;\pi)$, equivalent to $\{e^{inx}\}_{n\in Z}$.

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The analogues of classical Levinson theorem in Orlicz spaces

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Abstract

In this work, perturbed expotensial system $\{e^{i\lambda_n t}\}_{n\in Z}$ (where $\{\lambda_n\}$ is some sequence of real numbers) is considered in the Orlicz space $L_M(-\pi;\pi)$. We find a condition on the sequence $\{\lambda_n\}$, which is sufficient for the above system to form a basis for $L_M(-\pi;\pi)$. We establish an analogue of classical Levinson theorem on the replacement of a finite number of elements of this system by other elements. Our result are the analogues of the corresponding results obtained for Lebegue spaces $L_P, 1 \le p \le +\infty$. We also establish an analogues of classical Levinson theorem on the completeness of above system in the spaces $L_P, 1 \le p \le +\infty$.

Keywords: Orlicz space, Levinson theorem, basicity
Classification 2010: 33B10. 46E30. 54D70

Definition. N-function $M(\cdot)$ satisfies Δ_2-condition for large values of u, if

$$\exists k > 0 \wedge \exists u_0 \ge 0: M(2u) \le kM(u), \forall u \ge u_0.$$

Δ_2-condition is equivalent to requiring that, for $\forall l > 1, \exists k(l) > 0 \wedge \exists u_0 \ge 0$:

$$M(lu) \le k(l)M(u), \forall u \ge u_0.$$

Theorem. Suppose that the N-function $M(u)$ satisfies the $\Delta_2 -$ condition. Let $\{\lambda_k\}_{k\in N} \subset C$ be some sequence. In order for the exponential system $\{e^{i\lambda_k x}\}_{k\in N}$ to be not complete in $L_M(-\pi;\pi)$, it is necessary and sufficient that there exist an entire function $F(\lambda)$ vanishing at all points λ_k, $k \in N$ and admitting representation

$$F(\lambda) = \int_{-\pi}^{\pi} e^{i\lambda x}\overline{v(x)}dx,$$

where $v(x) \in L_N(-\pi;\pi)$ is some function.

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An explicit formula of the power series of the pressure in unbounded models of Kac-type

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Abstract

We derive an exact formula for the power series of the pressure in term of a relevant thermodynamic parameter for a wide class of unbounded models of Kac-type. The formula gives a method for proving analyticity of the pressure without using cluster expansions. The method is based on the Witten-Laplacian formalism introduced in the early 90th by Bernard Helffer and Johanne Sjostrand.
Keywords: Pressure, Witten Laplacians, Analyticity, Cluster Functions.

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Hermite-Hadamard Type Inequality for Generalized Exponentially p-Convex Stochastic Processes

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Abstract

This study introduces a new generalized exponentially p-convex stochastic process, which is an extension of the exponentially p-convex stochastic process. Hermite-Hadamard type inequalities for generalized exponentially p-convex stochastic processes and some boundaries for these inequalities are presented. The results obtained in this study have shown to be the generalization of many existing results.

Keywords: p-convex stochastic process, exponentially p-convex stochastic process, mean square integral, Hermite-Hadamard inequality.

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On frames of the form $\left\{\varphi^n(t)\right\}$

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Abstract

The main theorem in [1] shows that a system of the form $\left\{\varphi^n(t)\right\}_{n=0}^{\infty}$ cannot be a frame in $L_2(a,b)$ for any measurable function $\varphi(t)$. The classical exponential system shows that the situation changes drastically when one considers systems of the form $\left\{\varphi^n(t)\right\}_{n=-\infty}^{\infty}$ instead of $\left\{\varphi^n(t)\right\}_{n=0}^{\infty}$. To our knowledge, the characterization of all frames of the form $\left\{\varphi^n(t)\right\}_{n=-\infty}^{\infty}$ in $L_2(a,b)$ remains unanswered in the general statement. In this note we give a partial answer to this problem:

Theorem. *Suppose that a function $\alpha(t)$ defined on $[a,b]$ is an invertible function, inverse $\xi:[p,q]\to[a,b]$ of which satisfies the following conditions:*

1) *$\xi(t)$ is absolutely continuous, strictly increasing function on $[p,q]$; $\xi(p)=a$ and $\xi(q)=b$;*

2) *$[p,q]\subset[0,2\pi]$ and there are constants $A,B>0$ such that $A\le\xi'(t)\le B$ for all $t\in[p,q]$.*

Then the system $\left\{e^{in\alpha(t)}\right\}_{n=-\infty}^{\infty}$ is a frame in $L_2(a,b)$.

Acknowledgement. The authors are grateful to Professor B.T. Bilalov for encouraging discussion.

Keywords: Dynamical sampling, operator orbit, frame, Schauder bases, system of powers, Lebesgue spaces.

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Bayesian Inference and Prediction in the Pareto Distribution of the Second Kind Based on Records

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Abstract

We consider Bayesian inference in the Pareto distribution of the second kind using upper records. We derive the Bayes estimator as well as the highest posterior density credible regions. The Bayes estimator and the generalized maximum likelihood estimator are obtained. Bayesian Prediction intervals for future records are derived. We also obtain the probability distribution of the Bayes estimators and the generalized maximum likelihood estimator. An example using simulated data is given to illustrate the application of the procedures developed in this paper.

Keywords: Pareto Distribution, Records, Bayesian Methods, Prediction, Generalized Maximum Likelihood Estimator, Reliability Function

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Nonparametric Interval Estimation in the Stress-Strength Model

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Abstract

We consider nonparametric interval estimation methods for the stress-strength model. We presented several types of intervals, including intervals based on the Mann-Whitney statistic, kernel density estimators, empirical likelihood as well as bootstrap based intervals. A discussion and comparison of the performance of the intervals is given

Keywords: Bootstrap, Distribution Free Intervals, Empirical Likelihood, Kernel Density estimation

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Existence of a solution of the inverse problem for a second-order parabolic equation

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Abstract

It is required to determine $\{c(x), u(x,t)\}$ from the conditions:

$$u_t - \Delta u + c(x)u = f(x,t,u),$$

$$u(x,0) = \varphi(x),$$

$$\frac{\partial u}{\partial \nu} = \psi(x,t,u), \quad (x,t) \in S = \partial D \times [0,T],$$

$$\int_0^T u(x,t)dt = h(x),$$

$$(x,t) \in \Omega = D \times (0,T], 0 < T = const, \ x \in \overline{D} = D \cup \partial D, \ D \subset R^n .$$

We assume that the input data of the problem satisfy the some conditions.

If there is a solution of the problem, where $c(x) \in C(\overline{D})$, $u(x,t) \in C^{2,1}(\Omega) \cap C^{1,0}(\overline{\Omega})$, then under certain conditions regarding the smoothness of the input data, the problem can be reduced to an equivalent problem – to a system of integral equations. The existence of a solution of the system of integral equations is carried out by the method of successive approximations.

Theorem. Let some conditions imposed on the input data are satisfied. Then there exists a $T^*(0 < T^* \leq T)$ such that when $(x,t) \in \overline{D} \times [0,T^*]$ there exists a solution of the system of integral equations and $c(x) \in C(\overline{D}), u(x,t) \in C(\overline{D} \times [0,T^*])$.

Keywords: Inverse problem, equation of parabolic type, system of integral equations, method of successive approximations.

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Z-Symmetric Manifold With Projective Curvature Tensor

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Abstract

The object of the present paper is to study the Z-symmetric manifold with the projective curvature tensor. At first, we study the case of Z-tensor and projective Ricci tensor being of Codazzi type. Next, we consider recurrent Z-tensor and recurrent projective Ricci tensor. We
also study the Z-symmetric manifold with projective curvature tensor with divergence-free Z-tensor. Finally, we construct an example of the Z-symmetric manifold with projective curvature tensor.

Keywords: Projective curvature tensor, Z-symmetric tensor, Codazzi tensor, recurrent tensor.

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New Smoothing-Type Algorithm for Solving System of Non-Linear Inequalities

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Abstract

In this study, the problem of the system of non-linear inequalities (SNI) is investigated. It is proposed to solve SNI by the help of smoothing approximations. Two different types of smoothing approaches are combined with Newton method and a new algorithm is developed for solving the SNI. Some preliminary results are reported in order to demonstrate the efficiency of our algorithm.

Keywords: Smoothing techniques, system of non-linear inequalities.

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The impact of random noise in the death rate of prey for a non-linear model with harvesting

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Abstract

Mathematical modelling of the population dynamics traces its roots back to a seminal model independently developed by Lotka **[1]** and Volterra **[2]**. After their pioneering works, the relationship between prey and predator species has been extensively studied with various parameters, factors and functional responses. In this presentation, a non-linear prey predator model incorporating prey harvesting with Holling type-IV functional response, based on **[3],** is considered. Then a natural death rate in prey's dynamics has been incorporated. The primary objective is to theoretically analyze the population dynamics and discuss how the noise, incorporated in prey's death, affects the interactions of both species. The noise term translates the system of ordinary differential equations into a stochastic one. Steady state and non-dimensionalisation analyses are performed. A particular attention will be paid on an axial steady state. Deterministic population dynamics is compared with noise induced population dynamics for varying noise strength. The theoretical findings are complemented with various numerical simulations.

Keywords: Population dynamics, noise, stochastic differential equations, dynamical systems.

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Compactness of Hankel products and mixed Toeplitz-Hankel products on the Hardy space of the polydisk

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Abstract

In this talk, boundedness and compactness of Hankel products and mixed Toeplitz-Hankel products on the Hardy space of the polydisk are investigated. Our main tool is a mysterious transformation of operators, which is the analog of Stroethoff and Zheng's famous transformation S_w [5]. Such a very useful transformation has been already used in [1] to establish commutativity and Brown-Halmos theorems as well as some intertwining operator equations characterizing dual Toeplitz operators on the orthogonal complement of the Hardy space of the polydisk.

Keywords: Dual Toeplitz operator, Hankel and Toeplitz-Hankel products, Hardy space of the polydisk.

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s-Supplemented Modules

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Abstract

In this work, every ring has unity and every module is unital left module. Let M be an R-module. If every submodule of M which contains $SocM$ has a supplement in M, then M is called a socle-supplemented (or briefly, s-supplemented) module. In this work, some properties of these modules are investigated.

Keywords: Small Submodules, Radical, Socle, Supplemented Modules.

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On the Fredholmness of the Dirichlet Problem for a Second-order Elliptic Equation in Grand-Sobolev Spaces[1]

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Abstract

In this work a second order elliptic equation with nonsmooth coefficients is considered in grand-Sobolev classes $W_{q)}^2(\Omega)$ on a bounded n-dimensional domain $\Omega \subset R^n$ with a sufficiently smooth boundary $\partial\Omega$, generated by the norm of the grand-Lebesgue space $L_{q)}(\Omega)$. These spaces are non-separable and therefore the definition of a reasonable solution in them faces certain difficulties. For this purpose, a subspace $N_{q)}^2(\Omega)$ is distinguished in which infinitely differentiable and finite functions are dense. The strict inclusion $W_q^2(\Omega) \subset N_{q)}^2(\Omega)$ holds, where $W_q^2(\Omega)$ – is the classical Sobolev space. In this work, the corresponding theorems concerning traces, extensions, and compactness of a family of functions from $N_{q)}^k(\Omega)$ are proved. These results are applied to obtain a Schauder-type estimate up to the boundary.

Keywords: Grand-Sobolev space, Dirichlet problem, elliptic equation, Schauder-type estimates, Fredholmness.

References:

1. Bilalov B.T., Sadigova S.R. On solvability in the small of higher order elliptic equations in grand-Sobolev spaces. Complex Variables and Elliptic equations, 2020, DOI: 10.1080/17476933.2020.1807965

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On Solvability "in small" of Higher Order Elliptic Equations in Grand-Sobolev Spaces [2]

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Abstract

In this work the *m*-th order elliptic equation with non-smooth coefficients in grand-Sobolev space generated by the norm of the grand-Lebesgue space $L_{q)}(\Omega), 1 < q < +\infty$ is considered. These spaces are non-separable, and therefore, to use classical methods for treating solvability problems in these spaces, you need to modify these methods. To this aim, some subspace, where the infinitely differentiable functions are dense is considered. Then it is porved that this subspace is invariant with respect to the singular integral operator. Finally, using classical method of parametrics, the existence "in small" of the solution to the considered equation in $W_{q)}^{m}(\Omega)$ is proved.

Keywords: elliptic equation, grand-Sobolev space, solvability "in small".

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Interior Schauder-type Estimates for Higher-order Elliptic Operators in Grand-Sobolev Spaces 3

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Abstract

In this work, an elliptic operator of the m-th order L with continuous coefficients in the n-dimensional domain $\Omega \subset R^n$ in the non-standard Grand-Sobolev space $W_{q)}^m(\Omega)$ generated by the norm $\|\cdot\|_{q)}$ of the Grand-Lebesgue space $L_{q)}(\Omega)$ is considered. The considered non-standard spaces are not separable and therefore smooth functions are not dense in them, without which the solution in one sense or another cannot be determined. Based on the shift operator, separable subspaces of these spaces are determined, in which finite infinitely differentiable functions are dense. Interior Schauder-type estimates are established with respect to these subspaces.

Keywords: elliptic operator, grand-Sobolev space, interier estimates.

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Jensen Inequality and its Applications for B-convex Functions

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Abstract

Jensen Inequality is a significant inequality for convexity and it has numerous worthy applications. In addition, this inequality has an important place in abstract convexity. An abstract convexity type B-convexity and Jensen inequality are handled in this work. Some new Jensen type inequalities are studied and particular applications of the inequalities are given for B-convexity.

Keywords: Jensen Inequaliy, B-convexity, Mean values.

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Locally Artinian Semiperfect Modules

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Abstract

In this paper as a strong notion of semiperfect modules we introduced the notion of locally artinian semiperfect modules and verified that class of these modules is not empty. We characterized projective modules as locally-artinian semiperfect by using locally artinian projective covers. Finally we proved that a projective module P is locally artinian semiperfect if and only if P is locally artinian supplemented.

Keywords: locally artinian submodule, (locally artinian) supplement, (locally artinian) supplemented modules, projective (locally artinian) cover, (locally artinian) semiperfect modules.

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Singular operators in the local "complementary" generalized variable exponent Morrey spaces on unbounded sets

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Abstract

In this presentation we consider local "complementary" generalized Morrey spaces ${}^{c}\mathcal{M}^{p(.)}_{\{x_0\}}(\Omega)$ with variable exponent $\mathrm{p(x)}$ and a general function $\omega(\mathrm{r})$ defining a Morrey-type norm. We prove the boundedness of Calder´on-Zygmund singular operators with standard kernel in such spaces in case of unbounded sets Ω in $\mathbb{R}^n$.

Also we prove the ${}^{c}\mathcal{M}^{p(.)}_{\{x_0\}}(\Omega)$ boundedness of commutators of Calder´on-Zygmund singular integral operators.

Keywords: Maximal operator, singular integral operators, commutators, local "complementary" generalized Morrey space, BMO space.

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On Amply Cofinitely g-Radical Supplemented Modules

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Abstract

In this work, some new properties of amply cofinitely g-radical supplemented modules are studied. Let M be an amply cofinitely g-radical supplemented module. Then M is cofinitely g-radical supplemented.

Keywords: Small Submodules, g-Small Submodules, Supplemented Modules, g-Supplemented Modules.

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Some equivalents to convergences operator sequences in the weighted grand Lebesgue spaces

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Abstract

The article is devoted to the study of equivalent conditions which provide the validity of Korovkin theorems for a sequences of operators that convolution type with a positive kernel in weighted grand lebesgue spaces..we define weighted grand lebesgue space under the condition of weight function. Then we establish equaivalent conditions for convergence of convolution type operator sequences.

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Keywords: weighted grand Lebesgue spaces, Korovkin theorem, , positive linear operators, positive kernel

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An existence result for a semilinear nonuniformly elliptic equation

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Abstract

This abstract relates to the solvability of the Dirichlet problem for a class of second order divergent structure non-uniformly elliptic equations

$$\frac{\partial}{\partial z_i}\left(a_{ij}(z)\frac{\partial u}{\partial z_j}\right)+v(x)u(z)^{q-1}=0,\quad u(z)>0,\quad u\big|_{\partial\Omega}=0$$

in the bounded domain $\Omega\subset\Re^N, N=n+m$. For this equation a positive weak solution existence we have considered. Here the coefficients $\{a_{ij}(z)\};\ i,j=1,2,...N$ are measurable functions on domain Ω in Euclidean $n+m$-dimensional space $\Re^N$ of points $\{z=(x,y):\ x\in\Re^n, y\in\Re^m\}, n\geq 1, m\geq 1$. The non-uniform ellipticity condition is fulfilled for the coefficients:

$$C_1\left(\omega(x)|\xi|^2+|\eta|^2\right)\leq\sum_{i,j=1}^{N}a_{ij}(z)\zeta_i\zeta_j\leq C_2\left(\omega(x)|\xi|^2+|\eta|^2\right)$$

for all $\zeta=(\xi,\eta)$ with $\xi\in\Re^n,\eta\in\Re^m$. $\omega,v:\Re^n\to(0,\infty)$ are positive locally integrable function of the variable x (i.e. the function v does not depend on variable $y\in\Re^m$). $\omega\in A_2$ is a function from the Muckenhoupt class in $\Re^N$. It is assumed that, $q\in\left(2,2(n+m)/(n+m-2)\right)$. *Then it is stated that, at least one positive solution exists for the proposed above problem provided that some balance condition is fulfilled on pare of weights* (v,ω) (see, e.g in [1, 2]).

Keywords: nonuniformly elliptic equation, Muckenhoupt class, existence, Dirichlet problem, balance condition, compact imbedding, weak solution, mountain pass theorem, palas-smale condition.

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N- Soliton Solutions of the Klein-Gordon Equation with Integral Term

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Abstract

In this work, the generalized Zakharov - Shabat (ZS) system [1] is considered and a class of nonlinear evolution equations corresponding to this system is obtained in terms of Lax-pair by using the Ablowitz - Kaup - Newell - Segur (AKNS) method, [2]. The necessarily results for the inverse scattering problem on the whole axis is examined when the ZS system consists of two equations and the potential is real and symmetric, [3]. Using these results, the N-soliton solution of the Klein - Gordon equation containing integral terms is obtained by using inverse scattering transformation method. Then, the single soliton solution of this equation is obtained as a travelling wave solution and these solutions are compared.

Keywords: Zakharov-Shabat (ZS) System, Ablowitz-Kaup-Newell-Segur (AKNS) Method, Inverse Scattering Transform (IST), Klein Gordon Equation with Integral Term

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Eigensubspaces of resonancing endomorphisms with resonancing monoms of convergent power series

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Abstract

Investigation of spectral properties of endomorphisms, also weighted endomorphisms on different uniform algebras, usually leads to investigation these problems on the algebras formally convergent power series.

In this work we consider the algebra $\sum_2$ of series (formal or convergent series) of the form $\sum_{n,m} x^n y^m$ and endomorphism T of this space induced by formal series φ, which module of eigenvalues of linear part of φ are less than one, i.e. we consider the operator of the form $T:\sum_2 \to \sum_2, f \text{ a } f o\varphi (f \in \sum_2)$ where eigenvalues α_1, α_2 of the linear part of φ holds: $\alpha_i : 0 < |\alpha_i| < 1, (i = 1,2)$. In the resonansing case with the resonancing monoms eigenvalues and corresponding eigensubspaces of endomorphism T is set as follows.

Theorem: In the resonancing case with the resonancing monoms every eigenvalue of endomorphism T has the form $\lambda_q = \alpha^q (\alpha_1 = \alpha^m (m \geq 2), \alpha = \alpha_2$, where q is nonnegative whole number) and corresponding eigenfunction has the form $f_q(x,y) = y^q$ (or has the form $f_q(x,y) = x^q$). Consepuently, corresponding eigensubspaces are one-dimensional.

Keywords: algebra, endomorphism, monom, eigenvalue, eigenfunction.

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Application of a new family of third-order convergence to solve a nonlinear equations system for analog circuits

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Abstract

We present in this paper a new acceleration to solve nonlinear system of equations. It is a Third-Order family of Newton with cubic convergence, which includes; the finding of operate points in analog circuit with the aid of PyAMS software (Python for analog and mixed-signal). A general analysis of convergence error is given, and numerical illustrations are also given to compare the proposed methods with some other methods: NR (Newton Raphson), MA [3] and MW [5], by application the solve nonlinear system of equations on the analog circuit using the PyAMS simulator.

Keywords: Convergence, Nonlinear systems, PyAMS, Newton Raphson, Iterative methods, Analog circuits

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An Efficient Numerical Method For Solving Parabolic Partial Differential Equation

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Abstract

The parabolic partial differential equation has been used as a model for many situations. Therefore, the accuracy of numerical solutions is important in the literature. In this study, finite difference method is developed with Lagrange polynomials and applied to heat equation. The equation made discrete with this approach is solved by the implicit method to find the solution at each grid point. The numerical solutions were found to be more accurate when compared with the results obtained with the classical finite difference method. The results obtained were supported by tables and graphs.

Keywords: Partial differential equation, Finite difference method, Lagrange interpolation, Implicit method.

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A Chebyshev Collocation Method For Solving Nonlinear Blasius Equations

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Abstract

In this work, we give an approximate solutions for the nonlinear Blasius equations. To solve Blasius equation, the truncated shifted Chebyshev polynomials and collocation matrix-vector method are considered. The proposed method converts the Blasius equation into a nonlinear system equation with unknown Chebyshev coefficients. Some examples are presented to approve the given method.

Keywords: Blasius equation, numerical solution, Collocation method, Shifted Chebyshev polynomials, Chebyshev-Gauss grid**.**

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Effect of Hartmann Number on MHD-Stokes Flow in a Lid-Driven Cavity

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Abstract

Two-dimensional (2D) steady, incompressible, and electrically conductive Stokes flow in a rectangularly confined region with lid-driven is considered. After the governing equations of the flow in the region are obtained in the stream function/vorticity formulation, the finite difference method is used for the solution. Under the magnetic field applied from different directions, the variation of vortex formation and streamline bifurcations are examined.

Keywords: MHD-Stokes flow, Hartmann number, Lid-driven cavity, Eddy generation, Streamline bifurcation.

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On the stabilization of the solutions for nonlinear fourth order equation

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Abstract

In this work, we study a question of stabilization of solution for the nonlinear fourth order equation with nonlinear boundary conditions in a part of boundary, where boundary function has some smoothing properties.

Keywords: stabilization, nonlinear fourth order equation, behavior of solution, hyperbolic equation.

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Construction of a sequence of eigenvalues and eigenelements of a two-parameter problem with compact self-adjoint operators

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Abstract

In the classical theory of functional analysis, a variational method is used to construct a sequence of eigenvalues and corresponding eigenelements of a compact self-adjoint linear operator, given in some Hilbert space.

There is a similar variational method for finding the eigenvalue with the minimum modulus and the corresponding eigenelements for the two-parameter problem

$$\begin{cases} \lambda_1 K_{i,1}\varphi_i + \lambda_2 K_{i,2}\varphi_i = \varphi_i, \quad \varphi_i \in H_i \\ i = 1;\ 2 \end{cases}$$

with compact self-adjoint operators $K_{i,1}$, $K_{i,2}$, $i = 1;2$ in space H_i , $i = 1;2$. Moreover, the minimizing element is found as an element of the weight space $H_{\Delta_0} = H_1 \otimes H_2$, and this element, generally speaking, may not be a decomposable tensor. Therefore, it cannot be called its eigenelement of the given task. In this article, under the condition of right definiteness, we study a similar problem of constructing a sequence of eigenelements of the two-parameter problem.

Moreover, a) all elements of this sequence are eigenelements of this problem, b) all elements of this sequence are decomposable tensors, c) the sequence of eigenelements is a complete orthonormal basis for the space $H_{\Delta_0} = H_1 \otimes H_2$.

Keywords: multiparameter eigenvalue problems, spectrum, variational principles, definiteness conditions.

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Eigenvalues of a Three-Dimensional Biharmonic Operator with a Singular Potential

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Abstract

Consider the differential expression

$$l(u)=\Delta^2 u+\sum_{k=1}^{3}\alpha_k\cdot\delta\left(x-x^{(k)}\right)u$$

where $\Delta-$ three-dimensional Laplace operator, $\delta(x)-$ Dirac function, $x^{(k)}\in R^3,(k=1,2,3)$ are arbitrary fixed points, $\alpha_k\in R=(-\infty;+\infty)$, $k=1,2,3$.

In $L_2(R^3)$ we define the operator

$$A=\Delta^2+\sum_{k=1}^{3}\alpha_k\cdot\delta\left(x-x^{(k)}\right)$$

with domain $D(A)=\left\{u\in W_2^2(R^3): l(u)\in L_2(R^3)\right\}$.

In [1], the self-adjointness of the operator A in the space was proved.

It is investigated in the work that if the number $-\lambda^4\ (\lambda>0)$ is the negative eigenvalue of the operator A, then the number $\lambda>0$ is the root of the equation

$$\prod_{k=1}^{3}\left(1+\frac{\alpha_k}{4\sqrt{2}\pi\lambda}\right)+2\alpha_1\alpha_2\alpha_3\cdot G_0\left(\left|x^{(1)}-x^{(2)}\right|\right)\cdot G_0\left(\left|x^{(2)}-x^{(3)}\right|\right)\cdot G_0\left(\left|x^{(1)}-x^{(3)}\right|\right)-\left(1+\frac{\alpha_1}{4\sqrt{2}\pi\lambda}\right)\cdot\alpha_2\alpha_3\cdot G_0^2\left(\left|x^{(2)}-x^{(3)}\right|\right)-$$

$$-\left(1+\frac{\alpha_2}{4\sqrt{2}\pi\lambda}\right)\cdot\alpha_1\alpha_3\cdot G_0^2\left(\left|x^{(1)}-x^{(3)}\right|\right)-\left(1+\frac{\alpha_3}{4\sqrt{2}\pi\lambda}\right)\cdot\alpha_1\alpha_2\cdot G_0^2\left(\left|x^{(1)}-x^{(2)}\right|\right)=0.$$

Theorem. The largest number of different negative eigenvalues of the operator A is three. The number of eigenvalues is equal to the number of negative numbers $\alpha_1,\ \alpha_2,\alpha_3$. In particular, if $\alpha_1\geq 0,\ \alpha_2\geq 0,\alpha_3\geq 0$, then the operator A has no eigenvalues.

Keywords: Laplace operator, eighenvalues of the operator.

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Inverse Boundary-value Problem for a Two-dimensional Longitudinal Wave Propagation Equation with Integral Overdetermination Condition

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Abstract

This work is concerned with the study of the unique solvability of a nonlocal inverse boundary value problem for a two-dimensional longitudinal wave propagation equation [1] with an integral overdetermination condition. To investigate the solvability of the considered problem, we carried out a transformation from the original problem to some equivalent auxiliary one with trivial boundary conditions. Using the Fourier method, the solution of equivalent problem is reduced to the solution of integral equations, and the solvability of the obtained system of integral equations is proved by the principle of contraction mappings. Furthermore, using the equivalence, the existence and uniqueness of the classical solution to the original problem is shown. In addition, it should be noted that this work is based on ideas close to those used in [2-4].

Keywords: Inverse problem, longitudinal wave propagation, overdetermination condition, classical solution, existence, uniqueness.

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Dirichlet problem for noncoercive nonlinear elliptic equations in unbounded domains

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Abstract

In this talk we analyse noncoercive nonlinear Dirichlet problems in unbounded domains. Some complications arise as a consequence of the unboundedness of the domain and of the noncoercivity of the operator of our problem. To overcome these difficulties, we follow a nonlinear approach. Namely, in order to obtain an existence result, we approximate the solution of the problem by the solutions of suitable coercive nonlinear Dirichlet problems.

Keywords: Noncoercive nonlinear Dirichlet problems, discontinuous coefficients, unbounded domains.

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An Interactive Illustration of Ideal Flow Field

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Abstract

Being one of the recently emerged modern teaching and learning tools, GeoGebra has become a widely utilized interactive mathematical application that can be employed for educational purposes for various branches of science and engineering. In this particular study, the implementation of this software for an ideal two-dimensional flow field is presented. The developed applet aims to enable the user to grasp a visual understanding of the relation between the velocity vector field, streamlines and potential lines in a flow field. Besides, the applet portrays the pressure distribution given by the Euler equations which govern the ideal fluid flow and it allows the user to examine the spatial variation of the terms in the Bernoulli equation.

Keywords: GeoGebra, Streamlines, Potential lines, Euler Equations, Bernoulli Equation

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Some Combinatorial Properties of a Certain Hybrid Number Sequence

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Abstract

In this study, we introduce a new hybrid number sequence. Then we give some combinatorial properties of this sequence. Finally, we present a matrix representation of this sequence.

Keywords: Hybrid number, matrix method, generating function, Binet formula.

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Curve Couples With Joint Frenet Planes in Galilean 3-space

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Abstract

In this work we searched for the answer of the question '' Is it possible for different space curves to share the same Frenet planes in Galilean 3-space?'' We have obtained some results and gave characterizations for these curves.

Keywords: Frenet planes, curve couples

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Bivariate Finite Orthogonal Polynomials and Some Properties

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Abstract

The main aim of this paper is to establish fifteen finite sets of bivariate orthogonal polynomials, and introduce some general properties of them, which are orthogonality relation, differential equations, generating functions, recurrence relations and Rodrigues type representations.

Keywords: Orthogonal polynomial, Weight function, Generating function, Differential equation, Recurrence relation, Rodrigues type representation

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Lacunary Invariant Summability and Lacunary Invariant Statistical Convergence of Order η for Double Set Sequences

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Abstract

In this study, for double set sequences, we introduce the notions of lacunary invariant summability and lacunary invariant statistical convergence of order η $(0 < \eta \leq 1)$ in the Wijsman sense. Also, we investigate some properties of these new notions and the relations between them.

Keywords: Double lacunary sequence, invariant statistical convergence, order η, double set sequences, convergence in the Wijsman sense.

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Invariant and Invariant Statistical Equivalence of order β for Double Set Sequences

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Abstract

In this paper, for double set sequences, the concepts of asymptotical invariant equivalence and asymptotical invariant statistical equivalence of order β $(0 < \beta \leq 1)$ in the Wijsman sense were introduced. Also, some properties of these new equivalence concepts and the relations between them were investigated.

Keywords: Asymptotical equivalence, invariant mean, statistical convergence, order β, convergence in the Wijsman sense, double set sequences.

References:

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Some Convergence Theorems in Fixed Point Theory

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Abstract

In this presentation, we analyze some convergence theorems by using fixed-point iterative approximation under certain mapping classes. We also give some numerical examples to show the efficiency of these results.
Keywords: Fixed-point, iterative approximation, convergence.

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A Study On Matrix Sequence of Generalized Third-Order Jacobsthal Numbers

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Abstract

In this paper, we introduce and investigate the generalized third-order Jacobsthal matrix sequence and we deal with, in detail, three special cases of this sequence which we call them third-order Jacobsthal, third-order Jacobsthal-Lucas and modifed third-order Jacobsthal matrix sequences. We present Binet's formulas, generating functions, Simson formulas, and the summation formulas for these sequences. Moreover, we give some identities and matrices related with these sequences.

Keywords: third-order Jacobsthal numbers, third-order Jacobsthal sequence, third-order Jacobsthal matrix sequence, third-order Jacobsthal-Lucas matrix sequence.

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A New Approach To Fibonacci Tessarines With Fibonacci And Lucas number Components

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Abstract

In this paper, by using identities related to the Fibonacci and Lucas numbers we define Fibonacci Tessarine and Lucas tessarine. Moreover, we defined new vector which are called Fibonacci tessarine vector. We give properties of these vectors to expert in geometry

Keywords: Tessarine numbers, Fibonacci and Lucas Numbers, Fibonacci Tessarine Vector.

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On the Adaptive control synchronization and anti-synchronization of chaotic systems in 3d

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Abstract

In this work, we are interested in the synchronization and anti-synchronization of chaotic systems in 3d according to the adaptive control method. Firstly, complete synchronization is achieved between two identical 3d novel chaotic systems. Next, Anti-synchronization between tow non identical 3d chaotic systems is achieved via adaptive control method and Lyapunov theory of stability. Finally, illustrative figures are obtained using numerical simulation in Matlab to validate the results.

Keywords: Chaotic system, Synchronisation, Anti-synchronization,Lyapunov, Matlab.

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Recent results on α-Bernstein Operators

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Abstract

Bernstein basis of degree n on $x \in [0,1]$ is defined in [1] by

$$b_{n,i}(x) = \binom{n}{i} x^i (1-x)^{n-i} \qquad i = 0, \dots, n.$$

This bases function has been generalized by many researches to generalize Bernstein operators and to have better approximation results [5], α-Bernstein bases is one them. In this work, we focus on recent results on α-Bernstein operators and related approximation theorems, convergence by graphs [2-4].

Keywords: Voronovskaja-type theorems, α-Bernstein Operators, approximation properties.

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Some Approximation Results about Positive Linear Operators

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Abstract

It is well-known that Bernstein polynomials are one of the most widely-investigated polynomial in the theory of approximation and so, to obtain another generalization of classical Bernstein operators, Cai et al. [1] considered the Bézier bases with shape parameter λ in $[-1,1]$ and introduced λ-Bernstein operators. By taking λ-Bernstein polynomials into account, in the very recent past, Acu et al. [2] defined a new family of modified U_m^{ρ} operators and denote the new operators by $U_{m,\lambda}^{\rho}$.

Chen et al. [3] recently presented a generalization of classical Bernstein operators with the help of any fixed α in $\mathbb{R}$ which they called α-Bernstein operators (linear and positive for $\alpha \in [0,1]$) and discussed the rate of convergence, Voronovskaja-type formula and shape preserving properties of these positive linear operators. Mohiuddine et al. [4] constructed the Kantorovich variant of α-Bernstein operators. In this study, we focus on some recent works related to various Bernstein, Durrmeyer and genuine types operators as well as statistical approximation [5].

Keywords: Positive linear operators, Statistical Convergence.

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On basicity properties of the system of exponentials and trigonometric functions in weighted grand-lebesgue spaces

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Abstract

In this work we consider some systems of exponentials and trigonometrics functions in weighted grand-Lebesgue spaces. Due to the non-separability of weighted grand-Lebesgue spaces with a general weight, we introduce the subspaces $G_{p),\rho}(0,1) \oplus C$, $1 < p < +\infty$, generated by the shift operator of the weighted grand Lebesgue space $L_{p),\rho}(0,1) \oplus C$ with weight function satisfying the Muckenhoupt condition. The basis property of systems in $G_{p),\rho}(0,1)$, $1 < p < +\infty$, are studied.

Keywords: weighted grand Lebesgue space, Muckenhoupt classes, discontinuous spectral problems, basis, shift operator.

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Nature inspired algorithm to find the current expression Series RC electric circuit case

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Abstract

The Differential Equations (DE) that describe many attractive natural phenomena are one of the most motivating fields of mathematics. Solving Initial Value Problems (IVPs) in Ordinary Differential Equations (ODEs) via fundamental mathematical methods gives in general insuitable results especially in the case of difficult problems. Hence the solution of this lacks is found by using nayure-inspired algorithms. In this paper we propose by means of the Flower Pollination Algorithm (FPA) (Xin-She Yang, 2013) how to solve the IVPs arising from a circuit consisting of a Resistor and a Capacitor (RC) in both constant voltage and variable voltage cases. The conducted comparison between the exact solution and the algorithm outcomes in the investigated examples showed that the FPA yields satisfactorily precise approximation of the solutions.

Keywords: IVPs, FPA, Series RC circuit, Optimisation problems.

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Blow up of solutions for a system of plate equations

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Abstract

We analyze a system of viscoelastic plate equations with degenerate damping terms on a bounded domain R^n. We obtain the blow up result of weak solution in finite time.
Keywords: Viscoelastic equations, plate equation, degenerate damping, blow up.

References:

1. S. A. Messaoudi, Global existence and nonexistence in a system of Petrovsky, Journal of Mathematical Analysis and Applications, 265(2) (2002) 296-308.
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Growth of solutions for fourth order viscoelastic system

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Abstract

We consider a system of fourth order two viscoelastic equations with degenerate damping and source terms under Dirichlet boundary condition. We obtain exponential growth of solutions under some restrictions on the initial data, relaxation functions and degenerate damping terms.
Keywords: Viscoelastic equations, exponential growth, degenerate damping.

References:

1. E. Pişkin, Blow up of positive initial-energy solutions for coupled nonlinear wave equations with degenerate damping and source terms. Boundary Value Problems, 43 (2015) 1-11.
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Stability of solutions for a Krichhoff-type plate equation with degenerate damping

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Abstract

We investigate a Kirchhoff type plate equations with degenerate damping term. We establish every weak solution is stability, as times tends to infinity.
Keywords: Stability, Kirchhoff-type equation, degenerate damping.

References:

1. E. Pişkin, Existence, decay and blow up of solutions for the extensible beam equation with nonlinear damping and source terms, Open Math. 13 (2005) 408-420.
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Decay of solutions for a quasilinear hyperbolic system

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Abstract

We investigated quasilinear hyperbolic system with degenerate damping terms and nonlinear soruce term. We show the global solution of the problem decays to zero exponentially as the time approaches infinity.
Keywords: Quasilinear equations, hyperbolic equation, degenerate damping, decay.

References:

1. ST. Wu, General decay of solutions for a viscoelastic equation with nonlinear damping and source terms. Acta Math. Sci. 318 (2011) 1436-1448.
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Bi-Kolmogorov type operators and weighted Rellich's inequalities

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Abstract

We consider the symmetric Kolmogorov operator $L = \Delta + \frac{\nabla \mu}{\mu} \cdot \nabla$ on $L^2(\mathbb{R}^N, d\mu)$, where μ is the density of a probability measure on $\mathbb{R}^N$. Under general conditions on μ we prove first weighted Rellich's inequalities with optimal constants and deduce that the operators L and $-L^2$ with domain $H^2(\mathbb{R}^N, d\mu)$ and $H^4(\mathbb{R}^N, d\mu)$ respectively, generate analytic semigroups of contractions on $L^2(\mathbb{R}^N, d\mu)$. We observe that $d\mu$ is the unique invariant measure for the semigroup generated by $-L^2$ and as a consequence we describe the asymptotic behaviour of such semigroup and obtain some local positivity properties. As an application we study the bi-Ornstein-Uhlenbeck operator and its semigroup on $L^2(\mathbb{R}^N, d\mu)$.

This is a joint work with Davide Addona, Abdelaziz Rhandi, Cristian Tacelli.

Keywords: Higher order elliptic equations, Maximal regularity, Invariant measures, Weighted Rellich's inequalities.

References:

1. D. Addona, F. Gregorio, C. Tacelli, A. Rhandi: Bi-Kolmogorov type operators and weighted Rellich's inequalities. Preprint, arXiv:2104.03811

On $\left(D_{12}^{*}\right)-$ Modules

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Abstract

In this study, by inspring the definition of $\left(D_{12}\right)-$ modules, we introduce $\left(D_{12}^{*}\right)-$ modules and give various properties of this module classes. Let R be a ring and M be a right $R-$module. We call a module M is $\left(D_{12}^{*}\right)-$ module, if for every submodule A of M, there exist a direct summand B of M and an epimorphism $f: B \to \frac{M}{A}$ with $\ker(f) = {}_{\delta} B$.

Keywords: $\left(D_{12}\right)-$module, $\left(D_{12}^{*}\right)-$module

References:

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3. Keskin, D. and Xue, W., Generalization of lifting modules, Acta. Math. Hungar., 91(3), (2001), 253-261.

A Price Adjustment Model in Market Equilibrium with Conformable Laplace Method

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Abstract

In this study, we consider a price adjustment model which is a common and very important tool in market equilibrium. We provide the fundamental solutions of the model by an analytical/approximate method defined with the conformable derivative operator. Also, we take the Laplace transform into account to be able to obtain accurate and analytical solution. We represent our results by illustrative figures to point out the efficiency of fractional parameter. We prove the efficiency and accuracy of the Laplace transform and the series method constructed with the conformable operator in providing the solution to the mentioned financial model by considering the theoretical results and illustrative applications. It can be pointed out that the proposed method is an accurate way to solve such problems that include fractional-order parameter. One of the prominent properties of the method is the possibility of using it in solving the similar equations including fractional derivatives having different types of kernels.

Keywords: Price adjustment model, financial interpret, conformable derivative, Laplace transform, analytical solution.

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Babesiosis Disease Modeling of Fractional Order and Investigation of its Dynamics

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Abstract

In this study, we investigate the dynamics of the babesiosis transmission on bovine populations and ticks. The most prominent role in the transmission of the parasite is the ticks from the ixodidae family. The vector tick takes factors (merozoites in erythrocytes) from the diseased animal while sucking blood. To model and investigate the transmissions of this parasite and address this important issue, we consider the disease in a fractional epidemiological model. This paper, therefore, discusses the mechanisms of transmission of babesiosis defined in the Caputo fractional derivative sense to study the propagation mechanisms of babesiosis. The application of fixed-point theory is used to derive the concept of the qualitative properties of the mentioned model. The solution is obtained by using the homotopy perturbation Elzaki transform method (HPETM). Numerical simulations are performed, and the effect of the fractional order derivatives are investigated graphically.

Keywords: Caputo fractional derivative, fixed point theorem, babesiosis disease, epidemiology, perturbation method.

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Compact Multiplication Operators on Semicrossed Products

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Abstract

Compact multiplication operators on operator algebras have been first investigated by Vala in 1964 and since then they have been studied by many authors. Semicrossed products form a class of operator algebras constructed from dynamical systems. We characterize the compact multiplication operators on semicrossed products in terms of the corresponding dynamical system. We also characterize the compact elements of this algebra and determine the ideal they generate.

Keywords: Semicrossed products, non-selfadjoint Operator Algebras, multiplication operators, compact elements, recurrent points, wandering points, equicontinuity.

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Modeling and Control of an Unmanned Aerial Vehicle of a quadrotor type

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Abstract

In this paper, a flying robot or a quadrotor also called Unmanned Aerial Vehicle (UAV) is modeled by a nonlinear equation. After a linearization around an operating point, a command is developed to stabilize the flying robot at a predetermined position. Asymptotic stability is studied using the Lyapunov approach and simulations are carried out using Matlab Simulink software.

Keywords: Nonlinear system, linarization, Robot, Quadrotor, UAV, Lyapuniv stabilily.

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α-Dense Curves and Lipschitz Global Optimization

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Abstract

In this paper, we study a coupling of the Alienor method with the Piyavskii's algorithm. The classical multidimensional global optimization method involves great difficulties for their implementation to high dimensions. The Alienor method allows to transform a multivariable function into a function of a single variable for which it is possible to use efficient and rapid method for calculating the the global optimum. This simplication is based on the using of α-dense curves.

Keywords: Lipschitz global optimization, Alienor method, reducing transformation. Piyavskii's algorithm, alpha-dense curves.

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Some spectral properties of the diffusion operator with a spectral parameter in the boundary condition

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Abstract

In this paper, we consider the diffusion operator with real coefficients. The boundary conditions are nonseparated. One of these boundary conditions depends quadratically on the spectral parameter. Some spectral properties of this operator are studied.

Keywords: diffusion operator, nonseparated boundary conditions, eigenvalues.

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On a fractional hybrid Hadamard boundary value problem with nonlocal hybrid Hadamard integral boundary conditions

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Abstract

In this work, we investigate the existence of solutions for a class of hybrid differential equations involving the hadamard fractional derivative with nonlocal hybrid Hadamard

integral boundary conditions. To establish the existence results, we use a the generalization of Darbo's fixed point theorem combined with the technique of measures of noncompactness in the Banach algebras. The results are illustrated with an example.

Keywords: Darbo's fixed point theorem, measure of noncompactness, Hadamard fractional integral, closed and convex subset.

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Some Results in the Theory of Quasillinear Spaces

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Abstract

In this study, we present some new consequences and exercises of homogenized quasilinear spaces. We also research on the some characteristics of the homogenized quasilinear spaces. Then, we introduce the concept of equivalent norm on a quasilinear space. As in the linear functional analysis, we obtained some results with equivalent norms defined in normed quasilinear spaces.

Keywords: Quasilinear space, normed quasilinear space, inner product quasilinear space, homogenized quasilinear space, equivalent norms.

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Biquasilinear Functionals on Quasilinear Spaces and Some Related Result

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Abstract

In this paper, we will present the notion of the biquasilinear functional which is a new concept of quasilinear functional analysis. Just like bilinear functional, the notions of a biquasilinear functional and a quadratic form will not need to have the constitution of an inner product quasilinear space. We were able to define these functionals in any quasilinear space. After giving this new notion, we discuss some examples and prove some theorems for considerable exercises to the theory of biquasilinear functionals in Hilbert quasilinear spaces.

Keywords: Biquasilinear functional, quasilinear functional, quasilinear space, normed quasilinear space, inner product quasilinear space.

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On the backward stochastic differential equations

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Abstract: In this paper, we propose a new numerical method for 1-d backward stochastic differential equations, (BSDEs for short), without using conditional expectations. The approximations of the solutions are obtained as a solution of a backward linear system generating by the terminals conditions. Our idea is inspired from the extended Kalman Filter to non-linear system models by using a linear approximation around a deterministic nominal reference trajectories.

Keywords: Backward stochastic differential equation, Discrete time approximation, Feynman Kac's formula, Partial differential equation, Monte Carlo simulation'

Mathematics subject classification 2010: 60H10, 60H30, 60H35

A generalization of new periodicity concept on time scales

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Abstract.

In this study, the new periodicity concept on time scales introduced by Adıvar is revisited. We define two periodicity notions by utilizing shift operators as a generalization and relaxation of the new periodicity concept given in [1]. In particular cases, our discussions cover periodic functions, anti-periodic functions, Bloch periodic functions, and unbounded functions.

Keywords: Time scale, shift operator, new periodicity concept, (T,λ)-periodicity

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Bipolar Fuzzy Supra Topology

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Abstract

The aim of this work is to introduce bipolar fuzzy supra topological space and investigate the basic properties and then study on bipolar fuzzy supra continuity of bipolar fuzzy mappings.

Keywords: Bipolar fuzzy set, fuzzy supra topology, bipolar fuzzy supra topology, bipolar fuzzy supra continiuty.

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A Subclass of Multivalent Harmonic Convex Functions Defined with Subordination

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Abstract

We have introduced a generalized class of complex-valued multivalent harmonic convex functions defined with subordination. We obtain some properties of our class. The results obtained here include a number of known and novel results as their special cases.

Keywords: Harmonic multivalent functions, convex functions, subordination.

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Coefficient Estimates for Certain Subclasses of Analytic Functions Associated with a Differential Operator

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Abstract

In this paper, we investigate certain subclasses of analytic functions defined by generalized differential operators involving binomial series. Also, we obtain coefficient estimates involving of the nonhomogeneous Cauchy-Euler differential equation of order r.

Keywords: Analytic functions, coefficient bounds, differential operator, subordination.

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A New Subclass of Harmonic Univalent Functions and Its Some Properties

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Abstract

Harmonic functions are a classic title in the class of geometric functions. Many researchers have studied these function classes from past to present, and since it has a wide range of applications, it is still a popular class. In this study, we will examine harmonic univalent functions, a subclass of harmonic functions.

Keywords: Harmonic, Univalent, Linear Operator

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fe-Supplemented Modules

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Abstract

In this work, every ring has unity and every module is unital left module. Let M be an R-module. If every finitely generated essential submodule of M has a supplement in M or M have no finitely generated essential submodules, then M is called a finitely e-supplemented (or briefly, fe-supplemented) module (See also [3]). In this work, some new properties of these modules are investigated.

Keywords: Small Submodules, Supplemented Modules, Essential Submodules, Essential Supplemented Modules.

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Some Properties of eg-Supplemented Modules

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Abstract

In this work, every ring has unity and every module is unital left module. Let M be an R-module. If every essential submodule of M has a g-supplement in M, then M is called an essential g-supplemented (or briefly, eg-supplemented) module (See [6]). In this work, some new properties of these modules are investigated.
Keywords: g-Small Submodules, Radical, Essential Submodules, Essential Supplemented Modules.

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On The Conharmonic Curvature Tensor Of Nearly Cosymplectic Manifolds With Generalized Tanaka-Webster Connection Spaces

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Abstract

Almost contact manifolds with Killing structures tensors were defined in [4] as nearly cosymplectic manifolds. Blair and Showers [4] studied nearly cosymplectic structure (φ, ξ, η, g) on a Riemannian manifold M with η closed from the topological viewpoint. An almost contact metric structure (φ, ξ, η, g) satisfying $(\nabla_X\varphi)X=0$ is called a nearly cosymplectic structure[2].

In addition, a generalized Tanaka-Webster connection has been introduced by Tanno [5] as a generalization of Tabaka-Webster connection. Contact manifolds with generalized Tanaka-Webster connection were studied by many researchers

In this study, based on previous works, we focus Tanaka-Webster connection on nearly cosymplectic manifolds and we obtain some results. Also we study conharmonic curvature tensor of nearly cosymplectic manifolds with generalized Tanaka-Webster connection and we give a conharmonically flat nearly cosymplectic manifold with respect to the connection ∇.

Keywords: Nearly cosymplectic manifolds, generalized Tanaka-Webster connection, conharmonic curvature tensor.

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Blow-up and Decay of Solutions for a Delayed Timoshenko Equation with Variable-Exponents

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Abstract

In this work, we consider a delayed Timoshenko equation with variable-exponents. Under suitable conditions, we prove the blow-up of solutions in a finite time. Then, we obtain the decay results by using an integral inequality due to Komornik. Time delay effects arise in many applications and practical problems such as physical, chemical, biological, thermal and economic phenomena.

Keywords: Blow-up, Decay, Delay term, Timoshenko equation, Variable-exponents.

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Nonexistence of Global Solutions for a Plate Equation with Delay Term

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Abstract

In this work, we consider a plate equation with delay term. Under appropriate conditions, we prove the nonexistence of global solutions in a finite time. Generally, time delay effects arise in many applications and practical problems such as physical, chemical, biological, thermal and economic phenomena. Also, delay effects can be a source of instability.

Keywords: Delay term, Nonexistence, Plate equation.

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On ⊕-g-Rad-Supplemented Modules

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Abstract

In this work, every ring has unity and every module is unital left module. Let M be an R-module. If every submodule of M has a g-radical supplement that is a direct summand of M, then M is called a ⊕-g-Rad-supplemented module (See also [3]). In this work, some properties of these modules are investigated.

Keywords: Essential Submodules, Small Submodules, g-Supplemented Modules, ⊕-Supplemented Modules.

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Strongly ⊕-g-Rad-Supplemented Modules

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Abstract

In this work, every ring has unity and every module is unital left module. Let M be a g-radical supplemented R-module. If every g-radical supplement submodule is a direct summand in M, then M is called a strongly ⊕-g-Rad-supplemented module. In this work, some properties of these modules are investigated.

Keywords: Small Submodules, g-Supplemented Modules, ⊕-Supplemented Modules, g-Radical Supplemented Modules.

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New Families of Three-Variable Polynomials Coupled with Well-Known Polynomials and Numbers.

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Abstract

In this paper, we provide some identities by using the so-called symmetrizing endomrphism operators denoted by $\delta_{e_1e_2}$ $\delta_{e_2e_3}$, for which we can construct some new generating functions for the Trivariate Lucas polynomials and some other numbers and also polynomials based on our previous ones, see ([1-3, 5]).

Keywords: Generating functions; Trivariate Lucas polynomials; Symmetric function.

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An implicit-explicit local transform method for capturing stiff behavior of singularly perturbed boundary value problems

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Abstract

An effective numerical method for singularly perturbed boundary value problems is presented in this study. This approach is based on arbitrary directional implicit-explicit local differential transform method (IELDTM). The forward structure of the classical local DTM is extended to a parameter based implicit-explicit numerical method. To illustrate efficiency of the method, qualitative and quantitative results are presented for two challenging singularly perturbed BVPs. It is found that the current method eliminates the existing srawbacks of the DTM based shooting methods. The produced results have revealed that the IELDTM can capture the challenging stiff behaviors of the singularly perturbed BVPs.

Keywords: Stiff problem, Singularly perturbed BVPs, Collocation methods, Nonlinear modelling, Taylor series

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Modeling of variables affecting success with deep learning methods

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Abstract

Deep learning methods are one of the machine learning models that have spread rapidly in the field of education as well as in many other fields in the last decade. This method, which is also used for data mining purposes, is a fairly new method in educational literature. The aim of this study is to model and predict the science success of the most successful and the least successful students using the deep learning method. For this purpose, the data of Turkey's International Student Assessment Program (PISA) survey were used. The data set used in the study consists of the most successful 30% and the most unsuccessful 30% of the students from Turkey. As a result of the analysis, Jordan method was found as the most successful method among Elman, Jordan and MLP methods.

Keywords: Deep Learning, Elman, Jordan, PISA, Science Success Prediction

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On Jacobi-Dunkl approximations

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Abstract

In this work, we present the Jacobi-Dunkl polynomials. Then, we introduce the Jacobi-Dunkl coefficients and series. Finally, we study some approximations of functions by Jacobi-Dunkl series.

Keywords: Jacobi-Dunkl polynomials, Jacobi-Dunkl coefficients, Jacobi-Dunkl series.

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Boundary Null-Controllability Results For The Fourth Order Parabolic Equation

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Abstract

In this work, we consider the initial boundary value problem for one-dimensional linear fourth-order parabolic equation which is modeled by the thermal grooving through surface diffusion, [1]. The existence and uniqueness of the solution of the considered initial boundary value problem together with the solution of an inverse problem are shown in [2]. We obtained the null controllability of the slope of the groove root boundary by the method which is based on the moment problem used by Fattorini and Russell who solved controllability problems for second order parabolic equations (see [3,4]). This method is successfully described to the various initial boundary value problems related to the second-order linear heat equation [5].

Keywords: Fourth order parabolic equations; boundary null-controllability; the moment method.

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About the Minkowski Difference of Squares on a Plane.

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Abstract

This work describes the Minkowski sum and difference of sets and some of their important geometric properties. As a basic result, necessary and sufficient condition have created for the existence of the Minkowski difference of the squares given on the plane ¡ ^{2}. Also, the calculation formula and the exact method of finding the Minkowski difference of the squares given by the vectors corresponding to the side on the plane ¡ ^{2} are introduced.

Keywords: Minkowski difference, Minkowski sum, square, orthogonal projection of vectors, rotation.

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Periodic Solutions for Second Order damped vibration Systems

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Abstract

The purpose of this paper is to study the multiplicity of periodic solutions for a class of non-autonomous second-order damped vibration systems. New results are obtained by using Fountain theorem. These results improve the related ones in the literature.

Keywords : Damped vibration Systems; Periodic solutions; Fountain Theorem; Asymptotically quadratic conditions; Critical point.

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On Λ-Fractional Mechanics of Fractal Structures

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Abstract: Λ-Fractional Analysis has been proposed just to fill the gap exhibited by the well known fractional derivatives, especially in fulfilling the prerequisites of Differential Topology just to correspond to differentials. Therefore, the well known Fractional derivatives are not able to generate geometry. Nevertheless, it has been presented a homogenization procedure of fractal structures in Continuum Mechanics, using in fact fractional differential that does not exist. That procedure is proven unreliable, applying it to Cantor rod. Then the Λ-fractional axial deformation of the Cantor rod is discussed, under axial loading. The diagrams of the stresses and the displacements, in the initial space, are presented,.

Keywords: Λ-fractional Analysis, Λ-fractional derivative, Cantor set, Cantor rod, fractional deformation, stress, displacement.

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On Innovations of the Multivariable Fractional Hardy-Type Inequalities on Time Scales

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Abstract

Fractional integral-type inequalities, dynamic equations, integral operators and variable exponents have an important place in time scales theory and harmonic analysis. Our main goal in this study is to obtain the multivariable fractional Hardy-type integral inequality using a new version of Jensen's inequality for super-quadratic and sub-quadratic functions on time scales with variable exponents.

Keywords: Time scales, Jensen inequality, Fractional Hardy-Type inequalities, Variable exponent.

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Mathematical simulation models for optimal control of plantain Moko disease

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Abstract

A population simulation model with non-linear ordinary differential equations is presented, which interprets the dynamics of the banana Moko, with prevention of the disease and population of susceptible and infected plants over time. A crop with a variable population of plants and a logistic growth of replanting is assumed, taking into account the maximum capacity of plants in the delimited study area. Also, with the help of farmers, the costs of implementing prevention strategies and elimination of infected plants were calculated per week in order to determine the optimal conditions that control the disease and reduce production costs. We found that the implementation of prevention strategies (f) plays an important role, but the parameter that most influences the threshold value is the elimination of infected plants (g). However, to reduce production costs due to the high implementation of prevention strategies and to maintain the disease in a controlled state, both controls u_1 and u_2 should be implemented between 40% and 60%, obtaining with this percentage an approximate reduction of 51.37% in production costs per week, where in 23 weeks following the same conditions it is expected to have a healthy plantation without infected plants.

Keywords: mathematical models; moko; plantain; *Ralstonia solanacearum*; optimal control.

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e-Projective Modules

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Abstract

Let M and N be R-modules. M is said to be e-N-projective if for every exact sequence $N \xrightarrow{g} K \to 0$ with $Kerg(N$ and every R-module homomorphism $f : M \to K$, there exists an R-module homomorphism $h : M \to N$ with $goh=f$. In this work, some properties of these modules are investigated.

Key words: Essential Submodules, Exact Sequences, Injective Modules, Projective Modules.

2010 Mathematics Subject Classifcation: 16D10, 16D80.

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On solvability of an boundary value problem for Davis linear equation with periodic and integral condition

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Abstract

In the article, the author analyses one boundary problem for the fourth order parabolic equation with integral conditios. First, an original problem is reduced to the equivalent problem, the theorem of existence and uniquene ss of solution is proved for the latter. Then, using these facts the author proves existence and uniqueness of classical solution of the original problem.uniqueness of classical solution of the original problem.

Keywords: nonlocal boundary problem, parabolic equation, existence, uniqueness, classical solution

Consider the following nonlocal boundary value problem in the rectangle $Q_T = \{(x,t):\ 0 \le x \le 1, \quad 0 \le t \le T\}$: find a function $u(x,t) \in C^{(4,1)}(Q_T)$ which satisfies in Q_T the equation [1]

$$u_t(x,t) - u_{txx}(x,t) - \alpha u_{xx}(x,t) + \beta u_{xxxx}(x,t) + a(x,t)u(x,t) = f(x,t), \quad (1)$$

the nonlocal initial conditions

$$u(x,0) + \delta u(x,T) + \int_0^T p(t)u(x,t)dt = 0 = \varphi(x),\ 0 \le x \le 1, \quad (2)$$

the periodic conditions

$$u(0,t) = u(1,t), u_x(0,t) = u_x(1,t), u_{xx}(0,t) = u_{xx}(1,t), 0 \le t \le T, \quad (3)$$

and the non-local integral condition

$$\int_0^1 u(x,t)dx = 0,\ 0 \le t \le T, \quad (4)$$

where $\alpha > 0, \beta > 0,\ \delta \ge 0$ is a given numbers, and $a(x,t),\ \ f(x,t),\ p(t), \varphi(x)$ are the given functions.

The aim of this work is to prove the existence and uniqueness of solutions of the boundary value problem (1)-(4). To solve this problem, we pass from the original problem to some auxiliary problem. We prove the solvability of the auxiliary problem. Then we return to the original problem. As a result, we arrive at the conclusion about the solvability of the original boundary value problem.

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A numerical scheme based on Taylor wavelets for solving fractional differential equations

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Abstract

In this study, an effective algorithm is proposed for solving fractional order differential equations. The algorithm is based on Taylor wavelets. The operational matrices of fractional integrals are utilized to transform the fractional differential equation to an algebraic equations system. Illustrative examples are included to show the effectiveness of the method.

Keywords: Bernoulli wavelet, Fractional-order differential equations

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On Exact Solutions of Fractional Differential Equations

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Abstract

In this study, we aim to find the new exact solutions of fractional differential equations via the extended rational sine-cosine and sinh-cosh methods. The considered fractional differential equations can be converted to an ODE by applying a wave transformation and then the solutions of the ODE are supposed to in the extended rational forms. An algebraic equation system is derived by substituting the solutions to the ODE, and by doing some simplifications. When the system is solved, unknowns can be found. The methods are efficient and powerful.

Keywords: Fractional differential equation, exact methods, soliton, wave transformation.

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Notes on equalities of BLUPs under linear mixed model and its sub-sample models

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Abstract

A linear mixed model (LMM) $M : y = X\beta + Zu + \varepsilon$, and its two sub-sample LMMs $M_i : y_i = X_i\beta + Z_iu + \varepsilon_i$, i = 1, 2 are considered. This study concerns the problem of the equalities of linear predictors in M and M_i under general assumptions. We investigate the equality relations between the best linear unbiased predictors (BLUPs) of unknown vectors by using various rank formulas of block matrices and elementary matrix operations.

Keywords: BLUP, equalities, linear mixed model, random vectors, sub-sample model.

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On Duality of Some Sequence Spaces in Topological Sequence Spaces

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Abstract

The basic duality properties of sequence spaces was improved by Garling in [1]. The idea of α duality, which uses absolute convergence, is of course very well known, and is only including here for the sake of completeness. β duality, which uses ordinary convergence and was introduced by Köthe and Toeplitz, is also well known, it is a special case of more general ideas of duality consider by Persson [2]. The idea of γ duality is quite distinct, for a sequence spaces and its γ dual do not in general form a dual pair of vector spaces. However, topologies can be defined by β duality and λ duality in a very similar way, and the γ dual is sometimes useful. The main purpose of the article is to examine the duals of the some sequence spaces we have just developed. It is also a study on the concept of monotony.

Keywords: Topological Sequence spaces, FK-spaces, BK-spaces.

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A Note on Classical Schauder Fixed Point Theory

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Abstract

There are many kinds of fixed point theorems in the literature. Some of fixed point results for generalized contractions have been studied by some authors et al [1,2,3,4]. In 2011, Harjani et al [5] have presented some fixed point result for weakly C-contraction mappings in an ordered complete metric space. In this presentation, we extend the concept of existence of at least one point on normed spaces and prove the existence of such point with contraction type on integral equations. Moreover, we presented an example to support our results.

Keywords: Integral equations, Fredholm integral equations, fixed point theory.

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On the basis property of a system of eigenfunctions of a discontinuous second-order differential operator in a weighted grand Lebesgue spaces

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Abstract

A discontinuous spectral problem is considered for a second order differential equation with a spectral parameter in the boundary condition. The basis property of the problem in the subspace $G_{p),\rho}(0,1) \oplus C$, $1 < p < +\infty$, generated by the shift operator of the weighted grand Lebesgue space $L_{p),\rho}(0,1) \oplus C$ with function satisfying the Muckenhoupt condition is proved. The basis properties of the system of eigenvectors and associated vectors of the problem in $G_{p),\rho}(0,1)$, $1 < p < +\infty$, are studied.

Keywords: weighted grand Lebesgue space, Muckenhoupt classes, discontinuous spectral problems, basis, shift operator.

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Analogs of Korovkin theorems and their statistical versoins in weighted grand Lebesgue spaces

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Abstract

The article is devoted to the study of Korovkin theorems and their statistical versions in weighted grand Lebesgue spaces. Under the condition of the weight function for a sequence of positive operators in the weighted grand Lebesgue space, analogs of Korovkin theorems and their statistical versions are established.

Keywords: weighted grand Lebesgue spaces, Korovkin theorem, statistical convergence, positive linear operators, shift operator.

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Oscillation Results For Third-Order Differential Equations With Distributed Deviating Arguments

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Abstract

New sufficient conditions for the oscillation of all solutions to a class of third-order differential equations with distributed deviating arguments are established. An example is included to illustrate the results.

Keywords: Oscillation, third-order, neutral differential equation, distributed deviating arguments.

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On Basis Properties of a Perturbed System of Cosines in Generalized Lebesgue Spaces

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Abstract

Perturbed system of cosines with a piecewise continuous phase is considered. Particular cases of these systems are eigenfunctions of second-order discontinuous differential operators. For the basicity of this system in generalized Lebesgue spaces sufficient conditions are found for phase jumps.

Keywords: system of cosines, basicity, variable exponent, generalized Lebesgue space.

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An analogue of the Riesz theorem in Hardy-Morrey classes

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Abstract

In this work the Hardy-Morrey classes of analytic functions inside and outside the unit disk generated by the norm of the Morrey space on the unit circle is studied. Since the Morrey space is not separable, therefore, the analogue of the Riesz theorem in these classes differs from the classical version. The analogue of classical Riesz theorem with respect to the Hardy-Morrey classes is proved.

Keywords: Hardy-Morrey classes, Morrey space, Riesz theorem

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Wavelet Frames Associated with Linear Canonical Transform on Spectrum

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Abstract

The linear canonical transform (LCT) provides a unified treatment of the generalized Fourier transforms in the sense that it is an embodiment of several well-known integral transforms including the Fourier transform, fractional Fourier transform, Fresnel transform. Using this fascinating property of LCT, we in this paper construct associated wavelet frames. To be precise we introduce wavelet frames whose construction depends on the nonuniform multiresolution analysis associated with linear canonical transform (LCT-NUMRA) whose translation set is not necessarily a group. Furthermore we establish necessary and sufficient condition for such nonuniform wavelet frames associated with linear canonical transform.

Keywords: Frame, Nonuniform LCT Wavelets, Wavelet Frame, Linear Canonical Transform.

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Novel Analytical and Approximate-Analytical Techniques for Solving Fractional Partial Differential Equations

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Abstract

Fractional differential equations play an important role in modeling various phenomena from natural sciences and engineering. What makes fractional differential equations very interesting is the property of nonlocality. Many systems can be modeled with fractional derivatives better than the ones with integer-order derivatives. Some certain systems exhibt memory effect which means that modeling them via fractional derivatives will be suitable for understanding the dynamics and behavior of obtained solutions for such systems. While finding exact solutions for some partial differential equations formulated in the sense of fractional derivatives can be challenging for researchers due to the difficulty of obtaining such solutions, there are some recent novel techniques such as double Laplace transform method, differential transform methods, and some other related methods that can provide a great help in obtaining analytical or approximate analytical solutions for solving fractional partial differential equations. Investigations of such techniques are highly recommended for researchers who are working on modeling physical systems via fractional derivatives. All in all, fractional calculus is a powerful tool in modeling scientific and engineering phenomena. Therefore, a special focus on computational methods and analysis of fractional calculus is needed to provide an understanding to the proposed fractional models in real life applications.

Keywords: Fractional partial differential equations, Caputo fractional derivative, conformable derivative, double Laplace transform, differential transform method.

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Approximation by modified Lupa\c{s}-Stancu operators based on (p,q)-integers

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Abstract

The purpose of this paper is to construct a new class of Lupas operators in the frame of post quantum setting. We obtaine Korovkin type approximation theorem, study the rate of convergence of these operators by using the concept of K-functional and modulus of continuity, also give a convergence theorem for the Lipschitz continuous functions.

Keywords: Lupas operators, post quantum analogue, *q*-analogue, Peetre's K-functional, Korovkin's type theorem, convergence theorems.

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Simple Cryptanalysis on the Phony-RSA cryptosystem

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Abstract

In this advanced era, public-key cryptography is extremely important in the field of data communication. The Rivest-Shamir-Adleman (RSA) is regarded as one of the most powerful algorithms in the public-key cryptosystem. While the original RSA used two prime numbers, p, and q the RSA variant in this paper used four prime numbers, namely Phony-RSA cryptosystem. The RSA variant with phony modulus intends to prevent the limitations of an integer factorization attack by increasing the complexity of the factorization process by using a phony public-key exponent and a phony modulus. This work presents successful cryptanalysis of the said Phony-RSA cryptosystem via elementary mathematical proving. Furthermore, an algorithm and numerical examples of the cryptanalysis elaborated. Based on the result, the RSA variant with phony modulus is deemed insecure.

Keywords: RSA, Phony modulus, cryptanalysis, public key, prime number.

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On The Solution of Mathematical Problem Including Sequential Time Fractional Wave Equation

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Abstract

The purpose of this study is to establish the analytic solution of sequential time fractional wave equation subject to Dirichlet boundary and initial conditions, by seperation of variables method. The fractional derivative is taken in Caputo sense. The analytic solution is constructed in series form in terms of fractional trigonometric functions.

Keywords: Caputo fractional derivative, time fractional wave equation, fractional trigonometric function, Mittag-Leffler function

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On Rough $\mathcal{I}$-Convergence and Rough $\mathcal{I}$-Cauchy Sequence

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Abstract

In this study, we first defined the concept of rough $\mathcal{I}^*$-convergence and investigated the relations between rough $\mathcal{I}$-convergence and rough $\mathcal{I}^*$-convergence. Then, we introduced the notion of rough $\mathcal{I}$-Cauchy sequence and examined the relations between rough $\mathcal{I}$-convergence and rough $\mathcal{I}$-Cauchy sequence. Finally, we introduced the notion of rough $\mathcal{I}^*$-Cauchy sequence and investigated the relations between rough $\mathcal{I}$-Cauchy sequence and rough $\mathcal{I}^*$-Cauchy sequence.

Keywords: Ideal, Rough convergence, Ideal convergence, Rough ideal convergence, Rough ideal Cauchy sequence.

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The Effect of Music on the Cognitive Development of Early Childhood Period: A Pythagorean Fuzzy Set Approach

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Abstract

In this study, a new decision-making algorithm and method were given. We used PFS in the given method. PFS was preferred because it is known that PFS gives clearer results than IFS. The effect of music on cognitive development in early childhood was examined with this decision-making method. In practice, the opinions of the experts about cognitive development and the results of the method we proposed were compared. In this study, the expectation score function was used. Weights and thus the aggregated Pythagorean fuzzy decision value (APFDV) are calculated with the values obtained from this function. The ranking is done with APFDV. Here, the values obtained from expert opinions are determined as follows: Whichever expert has given more opinion about the criteria, has been in the ranking before. Again, whichever specialist has given fewer opinions remains behind the rankings. This is very suitable for real-life events. The rankings obtained from the algorithm of the study were the same as the rankings of the opinions of the experts.

Keyword: Decision-making, Pythagorean fuzzy set, cognitive development, early childhood, music education.

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A Novel Decision-Making Method of Pythagorean Fuzzy Soft Sets with Heart Disease Application

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Abstract

Pythagorean fuzzy set characterized by a membership degree and a non-membership degree, which satisfies the condition that the square sum of its membership degree and non-membership degree is less than or equal to 1. As a generalized set, Pythagorean fuzzy sets have a close relationship with intuitionistic fuzzy sets. The intuitionistic fuzzy set played an important role in decision-making problems in a very short period of time and was successfully used in many decision-making problems. However, in some real-life problems, the sum of membership degree and non-membership degree may be greater than 1. The sum of the squares of these degrees is less than 1. In this case, the Pythagorean fuzzy set is a very useful tool and enables more effective results in multiple attribute decision-making problems. In the present study, for the medical decision-making problem, the new method is proposed related to the Pythagorean fuzzy soft set. The real dataset which is called the Cleveland heart disease dataset is applied to this problem.

Keyword: Pythagorean fuzzy soft set, decision-making, comparison table, Cleveland dataset.

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On an approach for Discretization of KT System

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Abstract

The KT system, in other words, Kowalevski Top is the third integrable case of a heavy rigid body with a fixed point rotating in a constant gravitational field and it was found by S.Kowalevski [3]. The continuous Kowalevski equations for the motion of a rigid body are given by the following system:

$$\begin{cases} \dot{\Omega} = \Omega \times V + \alpha \Gamma \times \beta \\ \dot{\Gamma} = \Gamma \times V \end{cases}$$

where V corresponds to the angular velocity of the body measured relative to the moving frame and β indicates the center of mass of the body. Ω corresponds to the angular momentum of the body, related to the angular velocity by the classic formulas $\Omega_i = I_i V_i$, $i = 1,2,3$.

After applying bilinear method and using the gauge invariance and the time reversibility of the equations, we get gauge-invariant bilinear difference equations. Finally, we derive the explicit discrete KT system by considering bilinear transformation method and present sufficient number of the discrete conserved quantities for integrability.

Keywords: Discretization, heavy rigid body, bilinear method, gauge invariance.

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A new family of generating functions of binary products of bivariate Mersenne and bivariate Mersenne Lucas polynomials with (*p,q*)-numbers at positive and negative indices

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Abstract

In this work, we study the generalized (*p,q*)-numbers and bivariate Mersenne Lucas polynomials defined in [3, 5] We first give some new properties and results on the generalized (*p,q*)-numbers. Moreover, by using the symmetric functions we obtain the new generating functions for the products of bivariate Mersenne and bivariate Mersenne Lucas polynomials with (p,q)-numbers at positive and negative indices.

Keywords: Generalized (*p,q*)-numbers; Bivariate Mersenne polynomials; Bivariate Mersenne Lucas polynomials; Complete hommogeneous symmeyric functions; Generating functions.

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Korovkin type theorems and its applications via $\alpha\beta$-statistically convergence

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Abstract. In this paper we will introduce the generalized concept of the weighted $\alpha\beta-$ statistical convergence, introduced by Aktuglu. We will show a new $\alpha\beta-$weighted statistical convergence and based on this definition we will prove a kind of the Korovkin type theorems. Also we will show the rate of the convergence for this kind of weighted $\alpha\beta-$ statistical convergence and Voronovskaya type theorem.

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Almost Anti-periodic Solution of Inertial Neural Networks model on Time Scales

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Abstract

The problems of the existence and stability of almost anti-periodic solutions of inertial neural networks model on time scales are discussed. By developing an approach based on differential inequality techniques coupled with Lyapunov function method. A numerical example is given for illustration.

Keywords: Dynamical systems, Time scales, Exponential stability, Almost-anti periodic solution, Inertial Neural Networks.

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α*-ψ-Contractive Multivalued Mapping on Extended b-Metric Spaces

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Abstract

In this work, we extend α*-ψ-Contractive multivalued mapping and generalized α* ψ-Contractive multivalued mapping in the context of extended b-metric space and prove some fixed point results on such mappings, which generalize many pre-existing results in the literature. As application, we discuss Ulam-Hyres stability for fixed point problems via α*-ψ-Contractive multivalued mapping in the context of extended b-metric spaces.

Keywords: Complete extended b-metric space, Hausdorff metric, α*-ψ-Contractive multivalued mapping, generalized α*-ψ-Contractive multivalued mapping, Ulam-Hyers stability.

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Qualitative Analysis for the p-Laplacian Equation with Logarithmic Source Term

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Abstract

The present work demonstrated the qualitative analysis for nonlinear p-Laplacian type with logarithmic nonlinearity. In recent years, problems involving logarithmic source term have been discussed in many papers, and several results concerning the qualititive analysis have been obtained [1,2,3,4].

Keywords: Asymptotic behavior, Logarithmic nonlinearity.

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On ρ-Statistical Convergence of Sequences of Function

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Abstract

In this study, by using definition of ρ-statistical convergence which defined by Çakallı we introduce the concept of pointwise $(S,[\rho,f])$-summability, pointwise ρ-statistical convergence and uniform ρ-statistical convergence. Also, give some inclusion relations between these concepts.

Keywords: Statistical Convergence, Sequences of function, Cesàro summability.

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Hyperbolic Padovan and Perrin Numbers

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Abstract

The ratio of two consecutive Padovan and Perrin numbers converges to

$$\alpha = \sqrt[3]{\frac{1}{2}+\frac{1}{6}\sqrt{\frac{23}{3}}}+\sqrt[3]{\frac{1}{2}-\frac{1}{6}\sqrt{\frac{23}{3}}}$$

that is named as *Plastic constant* and was firstly defined in 1924 by Gérard Cordonnier. He presented applications to architecture; in 1958 he gave a lecture tour that pictured the use of the Plastic constant in many buildings and monuments.

On the other hand, hyperbolic numbers have applications in different areas of mathematics and theoretical physics. A hyperbolic number (or split complex number, also perplex number, double number) has two real number components a and b, and the set of hyperbolic numbers is

$$\mathsf{H} = \left\{ x = a + hb : \; h^2 = 1, a, b \in \mathsf{R} \right\}.$$

In recent years so many researchs activities can be seen on hyperbolic Fibonacci, Lucas, Jacobsthal and Tribonacci numbers. For example, in [1], it was investigated some properties of the hyperbolic Fibonacci numbers as defined $\overline{F}_n = F_n + hF_{n+1}$.

It is natural to marvel whether there exits a connection between the parameters hyperbolic numbers and Padovan, Perin numbers. The first main idea of this paper is to investigate the *hyperbolic Padovan and Perrin numbers* as indicated HPPN from now on. Then, by taking into account the properties of the hyperbolic numbers, we try to show some properties of HPPN. Moreover, we present interesting relationships between HPPN.

Keywords: Padovan number, Perrin number, hyperbolic number.

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Some Remarks on Solvability of Dirichlet Problem for Laplace Equation in Non-standard Function Spaces[4]

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Abstract

Non-standard grand-Lebesgue and Morrey spaces are considered in this work, together with grand-Sobolev and Morrey-Sobolev spaces generated by them. Dirichlet problems for Laplace equation in different versions are considered in these spaces in a bounded domain of n-dimensional space with sufficiently smooth boundary. These spaces are non-separable, so there arise some questions and differences in problem statements. We conduct a corresponding research and we illustrate the differences concerning the solvability in the classical Sobolev and Hardy spaces in two-dimensional case on the example of circle.

Keywords: non-standard Lebesgue Morrey, Grand-Sobolev, Morrey-Sobolev spaces, Dirichlet problem, Laplace operator, Hardy space, solvability.

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A New Approach to the Fixed-Circle Problem on S-Metric Spaces

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Abstract

In this talk, we give new solutions to the fixed-circle problem on S-metric spaces. To do this, we define the notions of Moradi type $x_0 - S -$ contraction, Geraghty type $x_0 - S -$ contraction and Skof type $x_0 - S -$ contraction. Using these new notions, we prove some fixed-circle theorems on S-metric spaces. Also, we give an example to show the validity of the obtained results.

Keywords: Fixed-circle problem, S-metric space.

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Spectral Singularities of the Quadratic Pencil of Difference Operators with a General Boundary Condition

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Abstract

We study the quantitative spectral properties of the non-selfadjoint singular difference operator L generated in $l_2(\mathbb{N})$ by the difference expression

$$\Delta(a_{n-1}\Delta y_{n-1}) + (q_n + 2\lambda p_n + \lambda^2)y_n = 0, n \in \mathbb{N},$$

and a general boundary condition

$$\sum_{n=0}^{\infty} k_n y_n = 0,$$

where $a_0 = 1$; $k_0 \neq 0$ and $\{a_n\}_{n=1}^{\infty}$, $\{q_n\}_{n=1}^{\infty}$, $\{p_n\}_{n=1}^{\infty}$ and $\{k_n\}_{n=1}^{\infty}$ are complex sequences and $\{k_n\}_{n=1}^{\infty} \in l_2(\mathbb{N}) \cap l_1(\mathbb{N})$. Sufficient conditions for the finiteness of the eigenvalues and spectral singularities are established. Especially, we make use of uniqueness theorems of analytic functions to prove that the operator L has a finite number of eigenvalues and spectral singularities with finite multiplicities.

Keywords: Eigenparameter, spectral analysis, eigenvalues, spectral singularities, discrete equations.

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Comparative study of ferrofluid lubricated double layer porous squeeze curved annular plates with slip velocity

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Abstract

A theoretical comparison has been discussed on the double layer porosity at the upper curved (exponential and hyperbolic profile) and flat lower surface of Shliomis model based ferrofluid lubrication on squeezed annular bearing considering slip velocity. The impact of double layer porosity is considered as per the modified Darcy's law, while the slip velocity effect adopted according to Beavers and Joseph's slip conditions. The modified Reynolds-Darcy equation incorporating double layer is solved to compute dimensionless pressure profile and load-bearing capacity (LBC). The graphical results for the present study reveal that the LBC increases in the case of magnetization, volume concentration and upper plate's curvature parameters while decreases with other parameters for both the film thickness profile. A comparative study suggests that exponential film thickness profile is more suitable to enhance LBC for the annular plates.

Keywords: Shliomis model, Curved annular plates, double layer porosity, slip velocity, load bearing capacity.

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Image Encryption Algorithm Using Chaos and Generating Functions

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Abstract

This work is an application of chaos in digital image encryption: a new encryption algorithm for digital images based on a generating function of Lucas balancing numbers , the obtained results showed that the proposed algorithm s characterized by high security, high performance and high speed.

Keywords: Chaos, Dynamic systems, , Generating functions, Digital images.

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Existence results for a Nonlinear Fractional boundary value problem

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Abstract

In this paper, we investigate the existence and uniqueness of solutions for class of nonlinear fractional differential equations with nonlocal boundary conditions. The existence results are obtained by using Leray-Schauder nonlinear alternative and Banach contraction principle. An example is presented at the end to illustrate the validity of our results.

Keywords: Existence , Banach contraction principle, , nonlocal boundary conditions, Fractional differential equation.

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Trilinear alternating forms on a vector space of dimension 8 over a finite field of characteristic 2

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Abstract

For vector spaces of dimension 8 over a finite field $\mathbf{F}_q$ of characteristic 2 all trilinear alternating forms are determined. There are 32 inequivalent trivectors in which 20 are full rank. By this result we have, in particular, for $q = 2$ the theorem of J.Hora [3].

Keywords: trivector, classification.

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r-Supplemented Modules

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Abstract

Let M be an R-module and $U,V\leq M$. If $M=U+V$ and $U\cap V<<_r V$, then V is called an r-supplement of U in M. If every submodule of M has a r-supplement in M, then M is called an r-supplemented module. In this work, some properties of these modules are investigated.

Keywords: Small Submodules, Radical, r-Small Submodules, Supplemented Modules.

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Existence Result for Elliptic Equation on Riemannian manifolds

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Abstract

In this talk, we study the existence of solution for certain nonlinear elliptic problems in the framework of Sobolev Riemannian manifolds. The Minty Browder's Theorem is used.

Keywords: Existence solution, Weak solution, Sobolev Riemannian manifolds, Minty Browder's Theorem.

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Oscillation and Asymptotic Behavior of Third Order Nonlinear Dynamic Equations with Delayed and Advanced Arguments in Neutral Term

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Abstract

In recent years, there has been much research activity concerning the oscillation of solutions of various functional differential equations and functional dynamic equations on time scales. In reviewing the literature, it becomes apparent that results on the oscillatory and asymptotic behavior of third order neutral dynamic equations on time scales are relatively scarce, and most of such results are concerned with the equations including only a neutral delay or a neutral advanced term. In this talk, we shall offer sufficient conditions for the oscillation and asymptotic behavior of solutions for a class of third-order functional dynamic equations on time scales with a mixed neutral term, that is, the neutral term contains both retarded and advanced arguments.

Keywords: Oscillation, asymptotic behavior, neutral, third order, dynamic equations, time scales.

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Approximation by New Bivariate Positive Linear Operators

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Abstract

The subject of approximation theory has attracted a great deal of attention mainly due to its numerous applications in various areas. The convergence of a sequence of positive linear operators is one of the remarkable areas relevant to approximation theory. In an earlier examples, Bernstein operators [1] which are discovered for the proof of the Weierstrass theorem [4], defined for any continuous function f defined on $C[0,1]$. Szasz-Mirakjan [3] and Baskakov operators [2] are the generalizations of Bernstein polynomials established for any continuous function on $[0,\infty]$. From past to present, many techniques have been intensively used in the construction for various modifications of many classical linear positive operators. One of the ways for the generalization of the operators is to construct the bivariate forms of the sequences.

This study is focuses on the bivariate extension of new modified operators constructed by Beta function. We mention some approximation properties of new operators and compare the rate of convergence bivariate forms of the linear positive operators by some illustrative graphics.

Keywords: Bernstein operators, Baskakov operators, Szasz operators, rate of convergence, modulus of continuity.

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Some Notes on UC-Modules

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Abstract

A submodule C of M is called a *closed submodule* of M if C has no proper essential extension in M. It is known that, for any submodule A of M, there exists a closed submodule C of M such that A is essential in C, and C is called a *closure* of A (in M). In this note, we give new facts about modules having the property that every submodule of its has a unique closure. Smith calls such modules as a UC-modules.

Keywords: UC-module, UC-cover, semisimple ring, V-ring, SI-ring, excellent extension.

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1. P.F. Smith, Modules for which every submodule has unique closure. Proceedings of the Biennial Ohio-Denison Conference, (1992) 302-313.

Some Necessary Conditions for Rough Wijsman Convergence

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Abstract

Wijsman[3]gave two necessary conditions for the Wijsman convergence of a sequence of sets, depending on the elements of the limit set of this sequence. In this talk,we generalize these conditions for rough Wijsman convergence. Since we have to take into consider the points of space in three different sets, we obtain three conditions for the rough Wijsman convergence.

Keywords: Rough convergence, Wijsman convergence,Sequences of sets.

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On the rough Hausdorff convergence

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Abstract

Apreutesei [1] developed the concept of norm given with the help of the Hausdorff distance from a set A to $\{0\}$ in the almost linear space. This space consists of sets that do not hold the inverse element property with respect to the Minkowski sum. In this study, we first prove that the rough Hausdorff convergence of a sequence $\{A_n\}$ of sets to the set A requires the rough convergence of the sequence of norms. Then we give the necessary and sufficient conditions for the rough convergence of the sequence $\|A_n - A\|$ to 0.

Keywords: Hausdorff distance, Rough convergence, Sequences of sets.

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The Non-Self-Adjoint Sturm-Liouville Operator with Discontinuity Conditions

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Abstract

In this paper, we consider the following non-self-adjoint Sturm-Liouville boundary value problem with discontinuity conditions

$$-y'' + q(x)y = \lambda^2 y, \quad x \in (0,a) \cup (a,\infty),$$
$$y(a-0) = \alpha y(a+0), \quad y'(a-0) = \alpha^{-1} y'(a+0)$$
$$y(0) = 0,$$

where $0 < \alpha \neq 1$, λ is a complex parameter, $q(x)$ is a complex valued function and satisfies the condition $\int_0^\infty x|q(x)|dx < \infty$. The eigenvalues and the spectral singularities of this problem are investigated and it is proved that this problem has a finite number of spectral singularities and eigenvalues with finite multiplicities under additional conditions, respectively

$$\int_0^\infty \exp(\varepsilon x)\,|q(x)|dx < \infty, \qquad \sup_{x\in\mathbb{R}_+}\{exp(\varepsilon x^\delta)|q(x)|\} < \infty$$

for $\varepsilon > 0$, $\frac{1}{2} \leq \delta < 1$. Moreover, we determine the principal functions corresponding to the eigenvalues and the spectral singularities of this boundary value problem.

Keywords: Non-self-adjoint Sturm-Liouville operator, discontinuity conditions, eigenvalues and spectral singularities, principal functions.

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Dynamics of COVID-19 Pandemic using Fractional Derivatives

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Abstract

COVID-19 disease, a deadly pandemic ravaging virtually throughout the world today, is undoubtedly a great calamity to human existence. There exists no complete curative medicine or successful vaccines that could be used for the complete control of this deadly pandemic at the moment. Consequently, the study of the trends of this pandemic is critical and of great importance for disease control and risk management. Computation of the basic reproduction number by means of mathematical modeling can be helpful in estimating the potential and severity of an outbreak and providing insightful information which is useful to identify disease intensity and necessary interventions. Considering the enormity of the challenge and the burdens which the spread of this COVID-19 disease placed on healthcare system, the present paper attempts to study the pattern and the trend of spread of this disease and prescribes a mathematical model which governs COVID-19 pandemic using Caputo type derivative. Local stability of the equilibria is also discussed in the paper. Some numerical simulations are given to illustrate the analytical results. The obtained results show that applied numerical technique is computationally strong for modeling COVID-19 pandemic.

Keywords: COVID-19 pandemic, Mathematical model, Caputo derivative, Stability results, Basic reproduction number, Fractional Adams-Bashforth method**.**

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A Note on Decomposability Theorems

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Abstract

In this work, we investigate the invariant closed ideals in a Banach lattice and also study the compressionally decomposability.

Keywords: Decomposability, weakly compact friendly operator, compressionally decomposability, Banach lattices.

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Some Applications of Mellin and Hankel Transforms

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Abstract

Firstly, we study the theory and applications of the Mellin transform. We derive the Mellin transform and its inverse from the complex Fourier transform. The Mellin Transform is introduced as the transformation of an holomorphic function which is similar to the Laplace transform. This is followed by a few applications of the Mellin transformations to differential equations. The basic operational properties of it are also provided. Secondly, we study the definition and basic operational properties of the Hankel transform. A large number of axially symmetric problems in cylindrical polar coordinates are solved with the help of the Hankel transform. Several examples of the applications of the Hankel transform applied to differential equations are illustrated.

Keywords: Mellin Transform, Hankel Transform

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STATISTICAL CONVERGENCE ON L-FUZZY SPACE

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Abstract

Fuzzy normed spaces are natural generalizations of normed spaces, fuzzy normed spaces and intuitionistic fuzzy normed spaces, based on some logical algebraic structures, which also enriches the notion of a L-fuzzy metric space.

In this study we give some results regarding statistical convergence of sequences on L-fuzzy normed spaces and investigate the relationship between statistical convergent, statistical Cauchy and statistical bounded sequences, which will be newly introduced on L-fuzzy normed spaces.
Keywords: *L* − Fuzzy normed space, statistical convergence sequence, statistical Cauchy and bounded sequence

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Some Convergence Stability and Data Dependence Results for K^* Iterative Algorithm of Quasi-strictly Contractive Operators

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Abstract

Let $(E, \|.\|)$ be a normed liear space. An operator $T: E \to E$ is called a quasi-strictly contractive operator if there exists $\delta \in [0,1)$ such that

$$\|Tx - p\| \leq \delta \|x - p\|, \forall x \in E, \qquad (1)$$

where $p = Tp$ (see (J. Math. Anal. Appl. 194 (1995), 911-933)).
Yu et al. (AIMS Mathematics, 6(7): 6699-6714) obtained some convergence and stability results for the following K^* iterative algorithm of T in (1):

$$\begin{cases} x_0 \in E, \\ x_{n+1} = Ty_n, \\ y_n = T[(1-\alpha_n)z_n + \alpha_n Tz_n], \\ z_n = (1-\beta_n)x_n + \beta_n Tx_n, n \geq 0, \end{cases}$$

where $\{\alpha_n\}$ and $\{\beta_n\}$ are real sequences in $[0,1]$.
In this presentation, we re-prove these results under some mild conditions imposed on $\{\alpha_n\}$ and $\{\beta_n\}$.

Keywords: Iterative algorithm, Fixed point, Quasi-strictly contractive operator, Convergence, Stability, Data Dependence.

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Difference Sequence Spaces Derived by Toeplitz Transform

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Absract

The sequence spaces $l_\infty(\Delta)$, $c(\Delta)$ and $c_0(\Delta)$ were introduced and studied by Kızmaz. In the present paper we define, the sequence spaces $\lambda(\Delta)$ are defined by Toeplitz transformation, where λ denotes the one of sequence spaces t_∞, t_c *and* t_0. Furthermore, the $\alpha-, \beta-$ and $\gamma-$duals of spaces $t_0(\Delta)$ and $t_c(\Delta)$ are computed and their bases are constructed. Finally, necessary and sufficient conditions on an infinite matrix belonging to the classes $(t_c(\Delta): l_\infty)$ and $(t_c(\Delta): c)$ are estabilished, and characterizations of some other classes of infinite matrices are also derived by means of a given basic lemma.

Keywords: Difference sequence space, Toeplitz sequence spaces, $\alpha-, \beta-$and $\gamma-$ duals and basis of sequence, Matrix mappings.

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On solvability "in small" of Higher Order Elliptic Equations in Symmetric Spaces[5]

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Abstract

A higher order elliptic equation with nonsmooth coefficients with respect to rearrangement invariant spaces on the domain $\Omega \subset R^n$ is considered in this work. Separable subspaces of these spaces are distinguished, in which infinitely differentiable and compactly supported functions are dense. Sobolev spaces generated by these subspaces are determined. Under certain conditions on the coefficients of the equation and the Boyd indices of a rearrangement invariant space, the solvability in the small of the considered equation in rearrangement invariant Sobolev spaces is proved. Some results concerning these particular cases are presented.

Keywords: elliptic equation, solvability "in small", rearrangement invariant spaces, Boyd indices.

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Goodness Of Fit Testing For The Log-Logistic Distribution Based On Type I Censored Data

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Abstract

A goodness of fit test procedure is proposed for log-logistic distribution when the available data are subject to Type I censoring. The proposed method extend the test procedure of Pakyari and Balakrishnan (2013) to log-logistic distribution. A Monte Carol power studies are conducted to evaluate and compare the performance of the proposed method with the existing classical methods for several alternative distributions. The proposed method exhibits higher power compared to classical method. In addition, applications on Type I censored real datasets for the proposed and classical methods are considered for illustrative purposes.

Keywords: Anderson–Darling statistic, Cramer–von Mises statistic; empirical power, goodness-of-fit testing, Kolmogorov-Smirnov statistic, log-logistic distribution, Monte Carlo power study, order statistics, Type-I censoring.

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Some Fixed Point Results with Application to a Nonlinear Equation

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Abstract

In this work, we have got some fixed-point results under certain conditions and we have compared some iteration methods in the sense of their convergence. We have also solved a nonlinear equation using one of these iteration methods. Finally, we have given some examples to show the efficiency of these results.
Keywords: Fixed-point, iteration methods, convergence, nonlinear equation.

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Introduction to the Fucik spectrum for the (p,q)-Laplacian operator

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Abstract

In this paper, we are interested in the Fucik spectrum of the (p,q)-Laplacian operator defined as

$$\Delta_{p,q}u = div(|\nabla u|^{p-2}\nabla u + |\nabla u|^{q-2}\nabla u)$$

through the following nonlinear problem

$$\begin{cases} -\Delta_p u - \Delta_q u = \lambda.P(x)\left(u^+\right)^{p-1} - \mu.Q(x)\left(u^-\right)^{q-1} & \text{in } \Omega \\ u = 0 & \text{on } \partial\Omega \end{cases}$$

Where Ω is a bounded domain in $\Re^N$ with smooth boundary $\partial\Omega$, the weights $P(x),\ Q(x) \in L^{\infty}(\Omega)$

And

$$\lambda,\mu \in \Re.$$

Under the appropriate assumptions, we show the existence of a non-trivial solution of our problem by Combining the Col theorem and the Ljusternick-Schnirelmann theory.

Keywords: (p,q)-Laplacian, Fucik spectrum, nontrivial solution, critical value, Ljusternick-Schnirelmann theory.

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Target Attractor Formed via Fractional Feedback Control

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Abstract

We discuss here the stabilization problem for the ODE dynamical model. To do it, one can form a Kolesnikov's subset attracting the phase trajectories to its neighbourhood in the phase space via the defining the appropriate feedback control signal [1]. Kolesnikov's target attractor algorithm provides the exponential convergence, but in the same time it demands the permanent power support pumping the energy to the system even when the control goal is achieved.

To decrease the power cost of Kolesnikov's control, we re-formulate the feedback in the form of Caputo's fractional derivative [2]. In this case the solution to the ODE together with the feedback control signal could be found with Rida-Arafa method based on the generalized Mittag-Leffler function [3].

We prove that for the certain constrain over the initial condition and the target stabilization level, the integer-dimensional Kolesnikov algorithm can be replace with the fractional target attractor feedback to provide the minimal power cost.

Keywords: Fractional feedback control for ODEs, Kolesnikov's target attractor, Power cost.

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Dynamical Behaviour of Lotka-Volterra Predator Prey System Involving Refuge Effect

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Abstract

In this study, the discrete time Lotka-Volterra predator-prey model with refuge effect is studied. Firstly, the discrete form is obtained from continuous time predator-prey model using Euler method. Secondly, the existence of equilibrium points under some conditions are shown and refuge effect on dynamics of the system is analysed. Then, local stability conditions for each
equilibrium point are studied. Moreover, conditions for the existence of flip and Neimark-Sacker bifurcations are determined. Finally, to support the obtained analytical results, some numerical simulations are presented.

Keywords: Stability analysis, flip bifurcation, Neimark-Sacker bifurcation, Lotka-Volterra predator prey system, prey refuge**.**

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A New Family of Generating Functions of Some Numbers and Polynomials

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Abstract

In this work, we give some new generating functions of bivariate Mersenne polynomials and the products of bivariate Mersenne polynomials with bivariate complex Fibonacci polynomials, bivariate complex Lucas polynomials, Jacobsthal and Jacobsthal Lucas numbers, Jacobsthal and Jacobsthal Lucas polynomials, and the products of bivariate Mersenne polynomials with Gaussian numbers and polynomials.

Keywords: Symmetric functions; Generating functions; Bivariate Mersenne polynomials, Bivariate complex Fibonacci polynomials; Gausian numbers.

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Mixed bifractional Brownian motion: Definition and preliminary results

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Abstract

In this paper, firstly, we introduce a new gaussian process as an extension of the well known bifractional Brownian motion as a linear combination of a finite number of independent bifractional Brownian motions. We have chosen to call this process the mixed bifractional Brownian motion. Secondly, we study some stochastic properties and characteristics of this process: The Holder continuity, the self similarity, the quadratic variation, the Markov property and the differentiability of the trajectories, the long-range dependence, the stationarity of the increments and the behavior of the noise generated by the increments of this process. We believe that our process can be a possible candidate for models which involve self similarity, long range dependence and non-stationarity of increments.

Keywords: Gaussian process; Self similarity; Brownian motion; Bifractional Brownian motion; Quadratic variation; Differentiability; Long range dependence.

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Lyapunov-type inequality for an anti-periodic fractional boundary value problem of the Riesz-Caputo derivative

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Abstract

In this paper, we derive a Lyapunov-type inequality for an anti-periodic fractional boundary value problem of the Riesz-Caputo differential equation. Moreover, we obtain a lower bound for the eigenvalues of the fractional boundary problem as a direct consequent of this inequality. We also provide a sufficient condition for nonexistence trivial solution for the boundary value problem.

Keywords: Lyapunov's inequality, fractional differential equation, eigenvalues, Riesz–Caputo derivative, boundary value problem.

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Positive solutions of fractional boundary value problems for a combined Caputo fractional differential equation

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Abstract

In this paper, we propose a new class of fractional boundary value problem with ta combined Caputo derivative and explain the physical interpretation of this new derivative. Under some assumptions, we investigate the fractional differential equation. Leray–Schauder and Krasnoselskii's fixed point theorems in a cone are adopted. We present existence of positive solutions for the boundary value problem. Finally, some examples are given to support theoretical findings.

Keywords: Positive solution, Fractional differential equation, Combined Caputo derivative, Boundary value problem.

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k-Order Fibonacci Polynomials on AES-Like Cryptology

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Abstract

Galois field has an important plays in many branches cryptology. One of these branches is Advanced Encryption Standard (AES). This encryption method is a method that uses polynomials on Galois fields. In this paper, we generalize the AES-like encryption process, which has been done before, from private to general made with 2x2 matrices. We redefine the elements of k-order Fibonacci polynomials sequences using a certain irreducible polynomial in our cryptology algorithm. So, this cryptology algorithm is called AES-like cryptology on the k-order Fibonacci polynomial matrix.

Keywords: Fibonacci Numbers, Fibonacci Polynomials, Fibonacci Matrix, Galois Field, k-Order Fibonacci Polynomials, k-Order Fibonacci Polynomial Matrix.

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Two Dimensional Gausssian Jacobsthal Sequence

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Abstract

In this paper, a new approach is taken toward the generalization of Jacobsthal sequences into the complex plane. It is shown that the Jacobsthal numbers are generalized to two dimensions. For special entries of this new sequence, some relations with classic Jacobsthal sequences are constructed. Binet formula, generating function, explicit closed formula, sum formula for the new two dimensional Gaussian Jacobsthal sequence are investigated. The relation between classic Jacobsthal Lucas numbers and two-dimensional Gaussian Jacobsthal numbers is obtained by using the Binet formula. By matrix algebra, it is obtained that the matrix representation of two dimensional Gaussian Jacobsthal sequence.

Keywords: Jacobsthal Numbers; Jacobsthal Lucas Numbers; Gaussian Jacobsthal Numbers; Generating Function.

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On the uniformly convergent of spectral expansions of functions for problems with a spectral parameter in a boundary condition

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Abstract

In this work we consider the spectral problem

$$-y''+p(x)y=\lambda y,\ \ 0<x<1, \tag{1}$$

$$y(0)=0,\ \ y'(0)=(a\lambda+b)y(1), \tag{2}$$

where λ is a spectral parameter, $p(x)$ is a complex-valued summable function, a and b are complex numbers ($a\neq 0$). Asymptotic formulas are obtained for the eigenvalues and eigenfunctions of the spectral problem. The main result of this work is the following theorem.

Theorem. Support that $f(x)\in L_1(0,1)$ has a uniformly convergent Fourier series expansion in the system $\{\sqrt{2}\sin nx\}_{n\in N}$ on the interval $[0,1]$. Then the function $f(x)$ can be expanded in Fourier series in the system of eigen and associated function $\{y_n(x)\}_{n=0,n\neq n_0}^{\infty}$ of the problem (1),(2), where $y_{n_0}(x)$ is an arbitrary eigenfunction corresponding to a simple eigenvalue, and this expansion is uniformly convergent on every interval $[0,c],0<c<1$. If $(f,z_{n_0})=0$, where $z_{n_0}(x)$ is the corresponding eigenfunction of the conjugate spectral problem, then the Fourier series of $f(x)$ in the system $\{y_n(x)\}_{n=0,n\neq n_0}^{\infty}$ is uniformly convergent on $[0,1]$.

Keywords: eigenvalues and eigenfunctions, asymptotic formulas, uniform convergence.

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On the basis property of eigenfunctions of a differential operator with integral boundary conditions in weighted Lebesgue spaces

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Abstract

Consider the spectral problem

$$-y'' + q(x)y = \lambda y, \quad 0 < x < 1, \tag{1}$$

with inteqral boundary conditions

$$U_k(y) = \sum_{j=0}^{2} \int_0^1 g_{kj}(x)\, y^{(2-j)}(x)\, dx = 0, \; k = 1,2, \tag{2}$$

where λ is a spectral parameter, $q(x)$ is summable and $g_{kj}(x)$ are continuous complex-valued functions. Definitions of regularity and strongly regularity of boundary conditions are given, and basis properties of eigenfunctions in weighted Lebesgue spaces $L_{p,\rho(\cdot)}(0,1)$ are studied, where $\rho(\cdot)$ is a general weight function satisfying the Muckenhoupt condition. The main result of this work is the following theorem.

Theorem. The eigen- and associated functions of the regular problem (1),(2) form a basis with brackets in $L_{p,\rho(\cdot)}(0,1)$, $1 < p < \infty$, and an ordinary basis in this space if boundary conditions are strongly regular.

Keywords: spectral problem, inteqral boundary conditions, eigenfunctions, weighted Lebesgue spaces, basis.

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Basis properties of perturbed system of exponents with piecewise linear phase in Morrey-type spaces

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Abstract

System of exponents with piecewise linear phase depending on some parameters is considered in this work. Morrey spaces are not separable and the continuous functions are not dense in these spaces. Basis properties of this system (such as completeness, minimality and basicity) are studied in a subspace of Morrey space where continuous functions are dense. A sufficient condition for the completeness (minimality or basicity) of this system in the mentioned subspace is found.

Keywords: exponential system, basicity, Morrey space.

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An efficient hyperbolic kernel function yielding the best known iteration bounds for linear programming

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Abstract

Interior-point methods (IPMs) for linear programming are generally based on the logarithmic barrier function. Peng et al. [3] in 2001 are the first to propose non-logarithmic kernel functions for solving IPMs, these functions are strongly convex and smooth coercive on their domains. Later on, in 2004, Bai et al. [4] introduced the first kernel function with a trigonometric barrier term. Since then, no other type has been proposed until 2020, where the hyperbolic type of kernel functions was introduced by I. Touil and W. Chikouche in [5] for semidefinite programming. They established that the complexity iterations of the algorithm based on the proposed kernel function are $\boldsymbol{O\left(n^{2/3}log(n/\epsilon)\right)}$ and $\boldsymbol{O\left(n\,log(n/\epsilon)\right)}$ iterations complexity for large- and small-update methods respectively**.**

The aim of this work is to improve the complexity result for large-update method. In fact, we present a new parametric kernel function with a hyperbolic barrier term. By simple tools, we show that the worst-case iteration complexity of our algorithm for large-update method is $\boldsymbol{O\left(\sqrt{n}log\,(n)log(n/\epsilon)\right)}$ iterations. This coincides with the currently best known iteration bounds for IPMs based on all existing kind of kernel functions.

Keywords: Linear programming, Primal-dual interior point methods, kernel functions, complexity analysis, Large- and small-update methods.

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Quasi-Exchange Ring

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Abstract

Exchange ring have been characterized by the property that for all $a \in R$, there exist an idempotent $e \in aR$ such that $(1-e) \in (1-a)R$. The elment $q \in R$ is called quasi-idempotent if $q^2 = uq$ for some central unit $u \in R$, or equivalently $q = ue$ where u is central unit and e is an idempotent in R. In this work we introduce the notation of quasi-exchange ring via quasi-idempotent and give some relation between quasi-exchange ring and (strongly)-quasi clean ring.

Keywords: (Quasi)-idempotent element, (quasi)-exchange ring, (quasi)-clean ring.

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Difference Sets: An application over twin primes

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Abstract

Difference set is a mathematical object that interfaces among algebra, number theory and combinatorics, and has wide applications in other diciplines. In this work, we will present the relationship between difference sets and binary sequences and construct a coded mask design, which is an application on astrophysics. In order to create the difference set required for this application, we design an algorithm using twin primes.

Keywords: Difference sets, twin primes, binary sequences

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A Note on Generalized Weighted Lorentz Spaces

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Abstract

This talk is devoted to the characterizations of the embeddings between weighted generalized Lorentz spaces. We will survey some known results, formulate the main tools that allow us to characterize the weights for which the identity operator is bounded between generalized weighted Lorentz spaces, present new results, and some applications of them.

Keywords: Generalized weighted Lorentz spaces, maximal operator, weighted inequalities, embeddings.

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Global existence and exponential decay of solutions for a higher-order parabolic equation with logarithmic nonlinearity

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Abstract

In this paper, we consider the inital boundary-value problem for a higher-order parabolic equation with logarithmic nonlinearity. By using the potential wells method, we obtain the existence of global weak solution. In addition, we also obtain the decay for the weak solutions.

Keywords: Higher-order heat equation, Global existence, Logarithmic nonlinearity.

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Blow-up of solutions for a higher-order heat equation with logarithmic nonlinearity

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Abstract

This work studies the inital-boundary value problem for a higher-order heat equation with logarithmic nonlinearity. Under suitable conditions on the datum, we prove the finite time blow-up of solutions.

.

Keywords: Higher-order heat equation, Blow-up, Logarithmic nonlinearity.

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On Stability of Bases Made from Perturbed Exponential Systems in Grand-Lebesgue Type Spaces

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Abstract

In this work, perturbed exponential system $\left\{e^{i\lambda_n x}\right\}_{n\in\mathbb{¢}}$ (where $\left\{\lambda_n\right\}$ is some sequence of real numbers) is considered in Grand-Lebesguse spaces $L^{p)}\left(-\pi,\pi\right)$. These spaces are non-separable (except for exceptional cases), and therefore the above system is not complete in them. Based on the shift operator, we define the subspace $G^{p)}\left(-\pi,\pi\right)\subset L^{p)}\left(-\pi,\pi\right)$, where continuous functions are dense. We find a condition on the sequence $\left\{\lambda_n\right\}$ which is sufficient for the above system to form a basis for the subspace $G^{p)}\left(-\pi,\pi\right)$. Our results are the analogues of those obtained earlier for the Lebesgue spaces L^p. We also establish an analogue of classical Levinson theorem on the completeness of above system in the spaces L^p, $1\le p<+\infty$.

Keywords: system of exponent, perturbation, Grand-lebesgue space, Levinson theorem.

Let's first define the Grand-Lebesgue space on $\left(a,b\right)$. It is a Banach space of all measurable functions over $\left(a,b\right)$ with the finite norm.

$$\left\|f\right\|_{L^{p)}(a,b)}=\sup_{0<\varepsilon<p-1}\left(\frac{\varepsilon}{b-a}\int_a^b\left|f\right|^{p-\varepsilon}dt\right)^{\frac{1}{p-\varepsilon}},\ 1<p<+\infty.$$

Theorem. *Let* $\left\{\lambda_n\right\}_{n\in\mathbb{¢}}$; $\left\{\mu_n\right\}_{n\in\mathbb{¢}}\in$ ¡ *be some sequences, such that* $\lambda_i\neq\lambda_j,\mu_i\neq\mu_j$ *for* $i\neq j$.

$$\sum_{n=-\infty}^{+\infty}\left|\lambda_n-\mu_n\right|^r<+\infty,$$

where $r\in\left(1,\min(p,q)\right),\frac{1}{p}+\frac{1}{q}=1$ *and* $p\in\left(1,+\infty\right)$ *is some number. If the system* $\left\{e^{i\lambda_n x}\right\}_{n\in\mathbb{¢}}$ *forms a basis for* $G^{p)}\left(-\pi,\pi\right)$, *equaivalent to the basis* $\left\{e^{inx}\right\}_{n\in\mathbb{¢}}$ *then the system* $\left\{e^{i\mu_n x}\right\}_{n\in\mathbb{¢}}$ *also forms a basis for* $G^{p)}\left(-\pi,\pi\right)$, *equivalent to* $\left\{e^{inx}\right\}_{n\in\mathbb{¢}}$.

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Kinematics of Dual Transformations in Lorentzian and Galilean Spaces

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Abstract

The dual transformation between Lorentzian spaces is defined in [1]. In Galilean and pseudo-Galilean spaces, the dual transformation is given in [2]. In this study, we examine the kinematics of dual transformations in Lorentzian and Galilean spaces together. We also make applications in both spaces.

Keywords: Dual transformation, kinematics, Lorentzian space, Galilean space.

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Invariant Summability and Invariant Statistical Convergence of Order η for Double Set Sequences

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Abstract

In this study, for double set sequences, we introduce the notions of invariant summability and invariant statistical convergence of order η $(0 < \eta \leq 1)$ in the Wijsman sense. Also, we investigate some properties of these new notions and the relations between them.

Keywords: Invariant summability, statistical convergence, order η, double set sequences, convergence in the Wijsman sense.

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Lacunary Invariant and Lacunary Invariant Statistical Equivalence of Order β for Double Set Sequences

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Abstract

In this paper, for double set sequences, the concepts of asymptotical lacunary invariant equivalence and asymptotical lacunary invariant statistical equivalence of order β $(0 < \beta \leq 1)$ in the Wijsman sense were introduced. Also, some properties of these new equivalence concepts and the relations between them were investigated.

Keywords: Asymptotical equivalence, double lacunary sequence, invariant statistical convergence, order β, convergence in the Wijsman sense, double set sequences.

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On the frameness of system of exponent with linear phase in $L_2(-\pi,\pi)$[6]

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Abstract

In this work the Hilbert frameness of the system $E_n^{\alpha} = \left\{e^{i(n+\alpha\, sign(n))t}\right\}_{n\in Z}$ is studied in Lebesgue space $L_2(-\pi,\pi)$, here α is a real parameter, Z is the set of integers.

The following theorem is true.

Theorem. *System* E_n^{α} *forms a Hilbert frame in Lebesgue space* $L_2(-\pi,\pi)$ *if and only if* $2\alpha - \frac{1}{2} \notin Z$. *Moreover, in this case its defect equals* $\left[2\alpha - \frac{1}{2}\right]$. *(*$[\cdot]$ *is the integer part)*

Keywords: Lebesgue space, Hilbert frame, system of exponents.

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Some Types of Boundedness for the Fuzzy Soft Sets

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Abstract

General bornological spaces play a key role in recent research of convergence structures on hyperspaces, in optimization theory and in the study of topologies on function spaces. In order to generalize this structure, in the present study, we attemp to define and investigate the concept of boundedness for the fuzzy soft sets. Hence we deal with the softification of the bornological spaces with the help of the parameterization tool. Moreover, we examine several basic and categorical properties of the proposed concepts.

Keywords: Fuzzy soft set, boundedness, bounded fuzzy soft mapping, category.

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A note on degenerate Hermite-based uni_ed Apostol-type polynomials and its certain properties

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Abstract

The main objective of this article is to introduce and investigate degenerate Hermite-based Apostol-type polynomials of degree n and to characterize their properties via different generating functions techniques. These polynomials are studied using the generating functions, series de_nition, and summation series techniques and methods. Several important recurrence relations and explicit representation for the antecedent class of polynomials are derived. As the special cases, the degenerate Hermite-based Apostol-type Bernoulli, Euler and Genocchi polynomials are obtained and corresponding results are also proved. By using di_erent analytical means, we further derive numerous summation formulae and general symmetric identities for degenerate Hermite-based Apostol-type polynomials.

Keywords: Degenerate Hermite polynomials, Degenerate Apostol-type polynomials, Degenerate Hermite-based Apostol-type polynomials.

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On Novel Generalization of Enriched Contraction Fixed Point Theorem via the Kirk's iteration

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Abstract

Based on the idea of enriched contractions due to Berinde and Păcurar in [1], we introduce the new generalized contractive mapping, called weak enriched contraction mapping. First, we apply the property that the set of fixed points of a weak enriched contraction mapping is equal to the set of fixed points of the new constructed mapping associated to a weak enriched contraction mapping to show that the cardinality of a set of fixed points of a weak enriched contraction mapping is 1 and the fixed point can be approximated by means of an appropriate Kirk's iterative scheme. Moreover, we also investigate a local and asymptotic version of weak enriched contraction mapping.

Keywords: Banach space, enriched contraction, fixed point, Picard iteration, Kirk's iteration.

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Maximal commutators in the local "complementary" generalized variable exponent Morrey spaces

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Abstract

In this presentation we consider local "complementary" generalized Morrey spaces ${}^{c}\mathcal{M}^{p(\cdot)}_{\{x_0\}}(\Omega)$ with variable exponent $\mathbf{p(x)}$ and a general function $\boldsymbol{\omega(r)}$ defining a Morrey-type norm. We prove the boundedness of the commutators of Hardy-Littlewood maximal operator in such spaces in case of unbounded sets $\boldsymbol{\Omega}$ in $\mathbb{R}^n$.

Keywords: Maximal operator, commutators, local "complementary" generalized Morrey space, BMO space.

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Existence and Decay of Solutions of Higher-Order Hyperbolic type Equation with Logarithmic Nonlinearity

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Abstract

In this presentation, we obtain the existence by using Galerkin method and potential well method of solutions for logarithmic higher order wave equation. The different mathematical behaviours of wave equations with logarithmic nonlinearity were considered by many authors [1,2,3,4].

Keywords: Decay, Existence, Logarithmic nonlinearity.

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Blow up of Solutions of Hyperbolic type Equation with Logarithmic Nonlinearity

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Abstract

In this paper, we study the nonlinear hyperbolic type equation with nonlinear logarithmic source term. By using the concavity method, we prove the upper and lower bound for blow up time. In recent years, the blow up solutions of wave equation with logarithmic nonlinearity were studied by many authors [1,2,3,4].

Keywords: Blow up, Logarithmic nonlinearity.

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A note on f- CLS-modules

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Abstract

Recall that a submodule N of M is called *fully invariant*, if $f(N) \subseteq N$ for all$f \in End(M_R)$. In this paper, we call a submodule N is f-*closed*, if N is fully invariant such M/N is nonsingular. The fundamental properties of f-closed submodules are investigated. Our focus is to develop the class of f-*CLS*-modules, in which every f-closed submodule is a direct summand. We present characterizations between the generalizations of extending modules and the former class.

Keywords: extending module, FI-extending module, fully invariant submodule.

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Stability of solutions for a viscoelastic coupled Lame system with logarithmic source and distributed delay terms

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Abstract

In this work, we consider a coupled Lame system with the presence of distributed delay term, viscoelastic, and logarithmic source terms. We describe an exponential decay of solutions, where an asymptotic stability result of global solution is obtained.

Keywords: coupled system, distributed delay term, exponential decay, Lame system, viscoelastic term.

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On Some Properties of the Riesz Potential in Grand-Lebesgue and Grand-Sobolev Spaces

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Abstract

In this work the Riesz-type potential in non-standard grand-Lebesgue and grand- Sobolev spaces is considered. The classical facts concerning Lebesgue and Sobolev spaces are transferred to this case. The established properties play an important role in the study of the solvability of boundary value problems for an equation of elliptic type in grand-Sobolev spaces.

Keywords: Riesz potential, grand-Lebesgue space, grand-Sobolev space

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Approximation by Trigonometric Polynomials in the Variable Exponent Weighted Morrey Spaces

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Abstract

In this talk we present the best approximation by trigonometric polynomials in the variable exponent weighted Morrey spaces $M_{p(.),\lambda(.)}(I_0,w)$ where w is a weight function in the Muckenhoupt $A_{p(.)}(I_0)$ class. We give a characterization of $K-$ functionals in terms of the modulus of smoothness in the spaces $M_{p(.),\lambda(.)}(I_0,w)$. Finally, we prove the direct and inverse theorems of approximation by trigonometric polynomials in the spaces $\widetilde{M}_{p(.),\lambda(.)}(I_0,w)$, the closure of the set of all trigonometric polynomials in $M_{p(.),\lambda(.)}(I_0,w)$.

Keywords: Variable exponent weighted Morrey spaces, best approximation, trigonometric polynomials, direct and inverse theorems.

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EXISTENCE AND STABILITY RESULTS FOR A NONLINEAR LAMINATED BEAM WITH THERMODIFFUSION EFFECTS AND A TIME-VARYING DELAY TERM

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Abstract

A one-dimensional thermodiffusion laminated beam system, with nonlinear damping and viscoelastic dissipation on the effective rotation angle and through heat conduction in the interfacial slip equations with a time-varying delay, is studied. We prove firstly the wellposedness of the considered problem with Dirichlet boundary conditions, via the FaedoGalerkin method. Secondly, we show that the solution energy admits an explicit and optimal decay rate from which the exponential and polynomial stability are just special cases. Moreover, we establish a weaker decay result in the case of non-equal wave of speed propagation and give some examples which illustrate our results.

Keywords: Laminated beam, viscoelasticity, convexity, nonlinear damping, thermodiffusion, time-varying delay, optimal decay.

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Weighted Hardy operators in local generalized Orlicz-Morrey spaces

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Abstract

In this presentation, we give sufficient conditions on general Young functions (Φ, Ψ) and the functions (φ_1, φ_2) ensuring that the weighted Hardy operators A_ω and $\mathcal{A}_\omega$ are of strong type from a local generalized Orlicz-Morrey space $M^{0,loc}_{\Phi,\varphi_1}(\mathbb{R}^n)$ into another local generalized Orlicz-Morrey space $M^{0,loc}_{\Psi,\varphi_2}(\mathbb{R}^n)$. We also obtain the boundedness of the commutators of A_ω and $\mathcal{A}_\omega$ from $M^{0,loc}_{\Phi,\varphi_1}(\mathbb{R}^n)$ to $M^{0,loc}_{\Psi,\varphi_2}(\mathbb{R}^n)$.

Keywords: Weighted Hardy operator, local generalized Orlicz-Morrey space, local BMO space.

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POSTER SESSION

A reading on Quasi M-Class Ak*Operators”

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Abstract

Operator theory has wide range of applications in the field of quantum mechanics. In this manuscript, we extended a new class of operator named Quasi M-class A k * operator and studied some of its spectral properties. In addition to that, the Kronecker product of quasi M-class A k *operators are also studied.

Keywords: Class A k * , M-class A k * , quasi M-class A k * , Weyl’s theorem.

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Upper Bounds on the Energy of Graphs in Terms of Matching Number

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Abstract

The energy of a graph G, $\mathcal{E}(G)$, is the sum of absolute values of the eigenvalues of its adjacency matrix. The matching number $\mu(G)$ is the number of edges in a maximum matching. In this paper, for a connected graph G of order n with largest vertex degree $\Delta \geq 6$ we present two new upper bounds for the energy of a graph: $\mathcal{E}(G) \leq (n-1)\sqrt{\Delta}$ and $\mathcal{E}(G) \leq 2\mu(G)\sqrt{\Delta}$. The latter one improves recently obtained bound

$\mathcal{E}(G) \leq \{$ / ⌈ ⌉ ⌈ ⌉ \

Where Δ_α stands for the largest edge degree and $\alpha = 2(\Delta_\alpha + 1)$. We also present a short proof of this result and several open problems.

Keywords: Energy (of graph), graph energy, matching number.

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On Triangular Matroids Induced by n_3-Configurations

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Abstract

A triangular matroid is a rank-3 matroid whose ground set consists of the points of an n_3-configuration and whose bases are the point triples corresponding to non-triangles within the configuration. Raney previously enumerated the n_3-configurations which induce triangular matroids for $7 \leq n \leq 15$. In this work, the enumeration is extended to configurations having up to 18 points. Several examples of such configurations and their symmetry groups are presented, as well as geometric representations of the triangular matroids induced by these configurations.

Keywords: classification, configuration, matroid, triangle

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A new class of symmetric function of binary products of Bivariate Complex Fibonacci with orthogonal polynomials

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Abstract

In this work, we define and study the bivariate complex Fibonacci and Lucas polynomials. We introduce an operator in order to derive some new symmetric properties of bivariate complex Fibonacci and bivariate complex Lucas polynomials, and give the generating functions of the products of bivariate complex Fibonacci polynomials with orthogonal polynomials. By making use of the operator defined in this paper, we give some new generating functions of the products of bivariate complex Fibonacci polynomials with Gaussian Jacobsthal, Gaussian Jacobsthal Lucas polynomials and Gaussian Pell polynomials.

Keywords: Bivariate complex Fibonacci numbers; Gaussian Jacobsthal; Gaussian Pell polynomials; Symmeyric functions; Generating functions.

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EXISTENCE AND UNIQUENESS OF GLOBAL SOLUTION OF STOCHASTIC CHEMOTAXIS MODEL

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Abstract

In this present paper, we study of nonlinear stochastic partial differential equation chemotaxis keller-Segel model with homogeneous dirichlet boundary conditions perturbed by additive space-time white noise. We then present the existence and uniqueness of the global solution for the corresponding transition semigroup theory.

Keywords: Stochastic Keller-Segel model, semigroup theory, dirichlet boundary conditions, space-time white noise, Gaussian process, Chemotaxis.

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STABILITY RESULT FOR VISCOELASTIC MOORE-GIBSON-THOMPSON EQUATION WITH MEMORY IN THE WHOLE SPACE

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Abstract

The main goal of this paper is to investigate the existence and stability of the solutions for the Moore—Gibson—Thompson equation (MGT) with a memory term in the whole spaces R^N. First, we show that the problem is well-posed under an appropriate assumption on the coeffcients of the system. Then, we built some Lyapunov functionals by using the energy method in Fourier space. These functional allow us to get control estimates on the Fourier image of the solution.

Keywords:
Moore-Gibson-Thompson equation, memory kernel, energy method, exponential decay, polynomial decay, regularity loss

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An Algorithm for Reconstructing the Sturm-Liouville Operator with a Spectral Parameter Square Including the Boundary Condition

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Abstract

The work is devoted to the study of the inverse problem for the Sturm-Liouville operator with nonseparated boundary conditions. One of these boundary conditions includes the quadratic function of the spectral parameter. An algorithm for solving the inverse problem is constructed. As spectral data, we use spectrum of one boundary value problem, a certain sequence of signs, and a certain number.

Keywords: Sturm-Liouville operator, nonseparated boundary conditions, eigenvalues, inverse problem, solution algorithm.

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Introducing intrinsic and hyperbolic type metrics

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Abstract

One of the most important concepts in the geometric function theory is an *intrinsic distance*, which is defined here by using several hyperbolic type metrics and quasi-metrics, such as the triangular ratio metric, as examples. A new intrinsic metric called the t-metric is introduced. The behaviour of all the metrics presented in the work is explained by analysing the differences between the disks drawn with these metrics in simple polygon domains.

Keywords: Hyperbolic geometry, hyperbolic type metrics, intrinsic metrics.

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Numerical procedure for fluid-structure interaction with a fixed point algorithm

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Abstract

In this work, we have proposed a fixed point algorithm in order to solve a fluid-structure interaction problem with the supplementary constraint that the structure displacements are limited by a rigid obstacle. Fictitious domain approach with penalization is used for the fluid equations. The surface forces from the fluid acting on the structure are computed using the fluid solution in the structure domain. A convex constrained optimization problem is solved in order to get the structure displacements. Numerical results are presented.

Keywords: Fictitious domain, fluid-structure interaction, contact mechanics, rigid obstacle, structure velocity.

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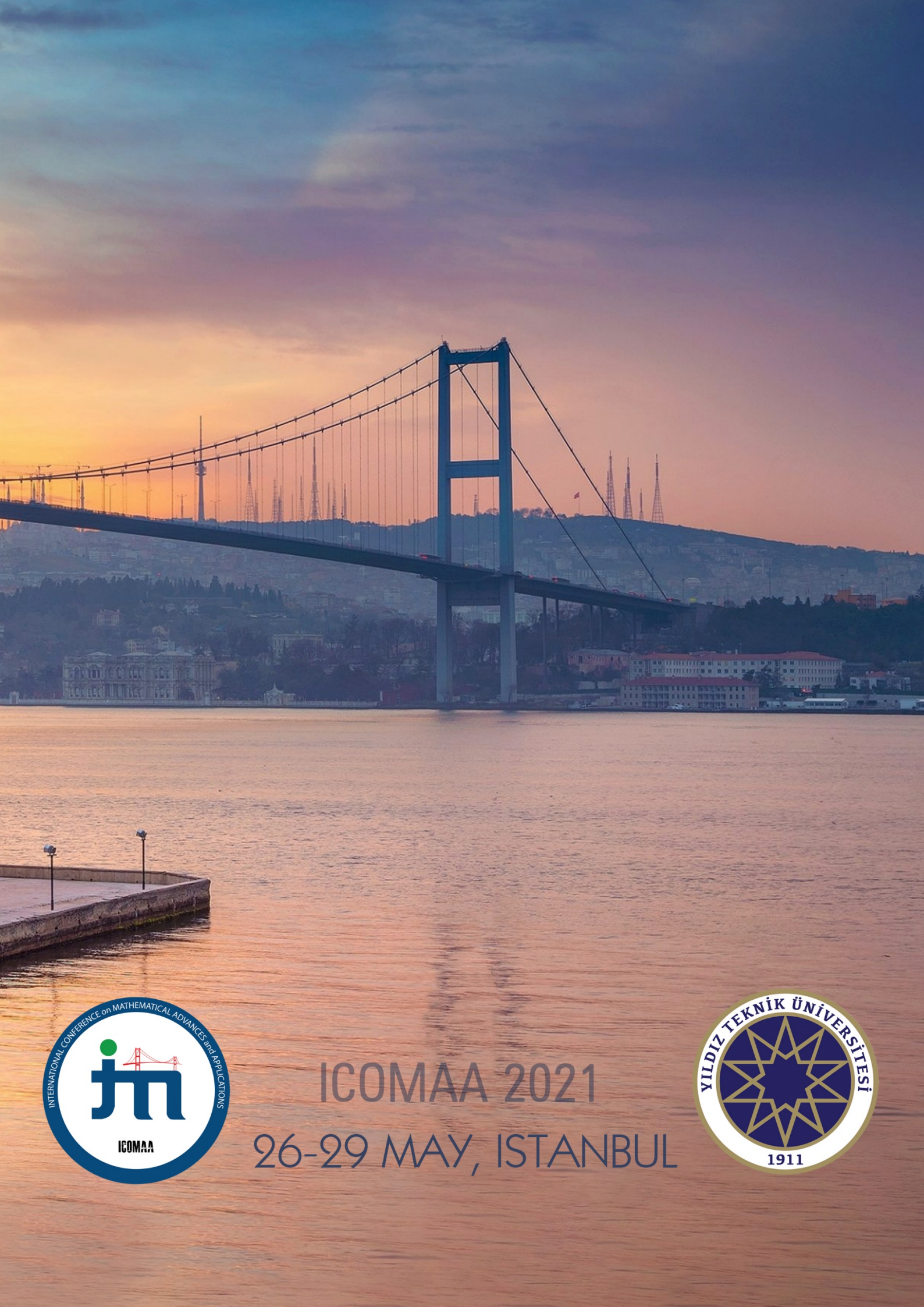

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