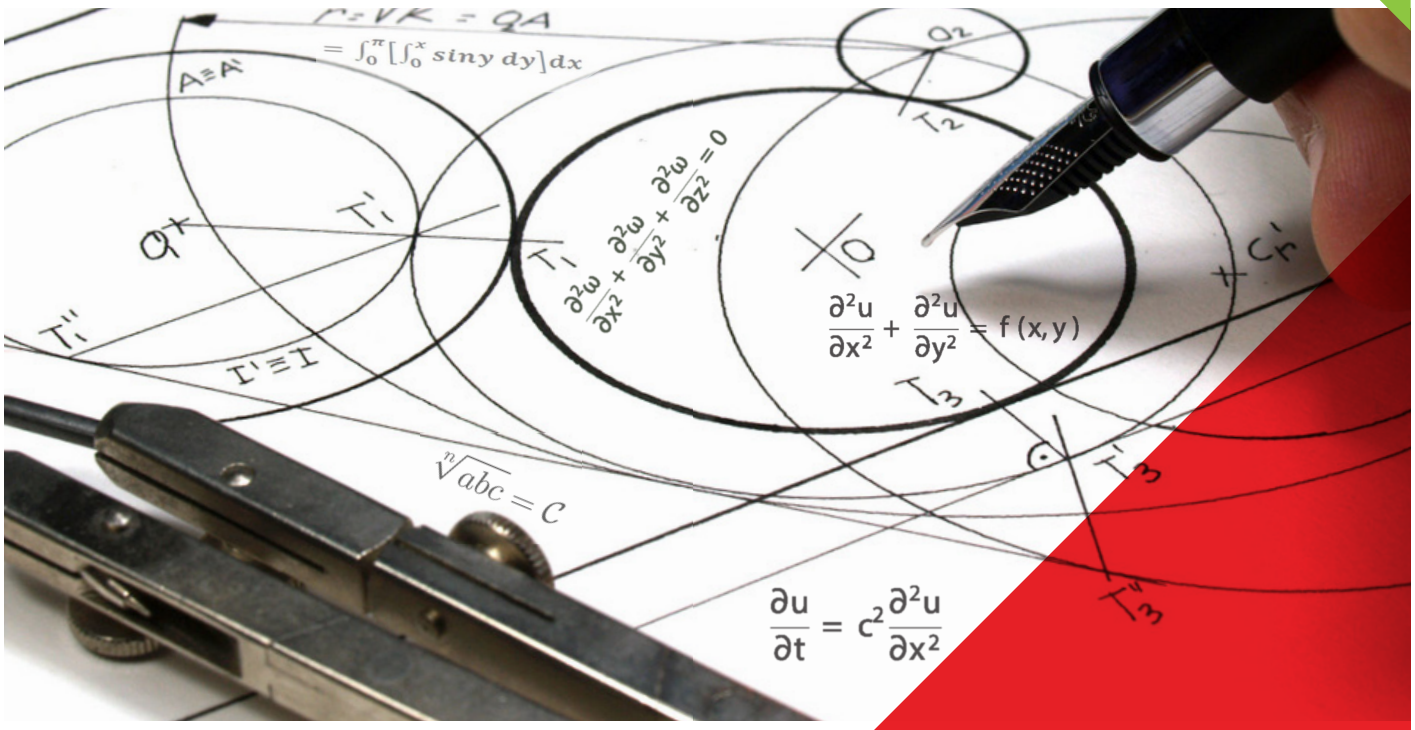
جامعة أبوظبي
ABU DHABI UNIVERSITY

The 4th Abu Dhabi University Annual International Conference

Mathematical Science and its Applications

ABSTRACTS BOOK



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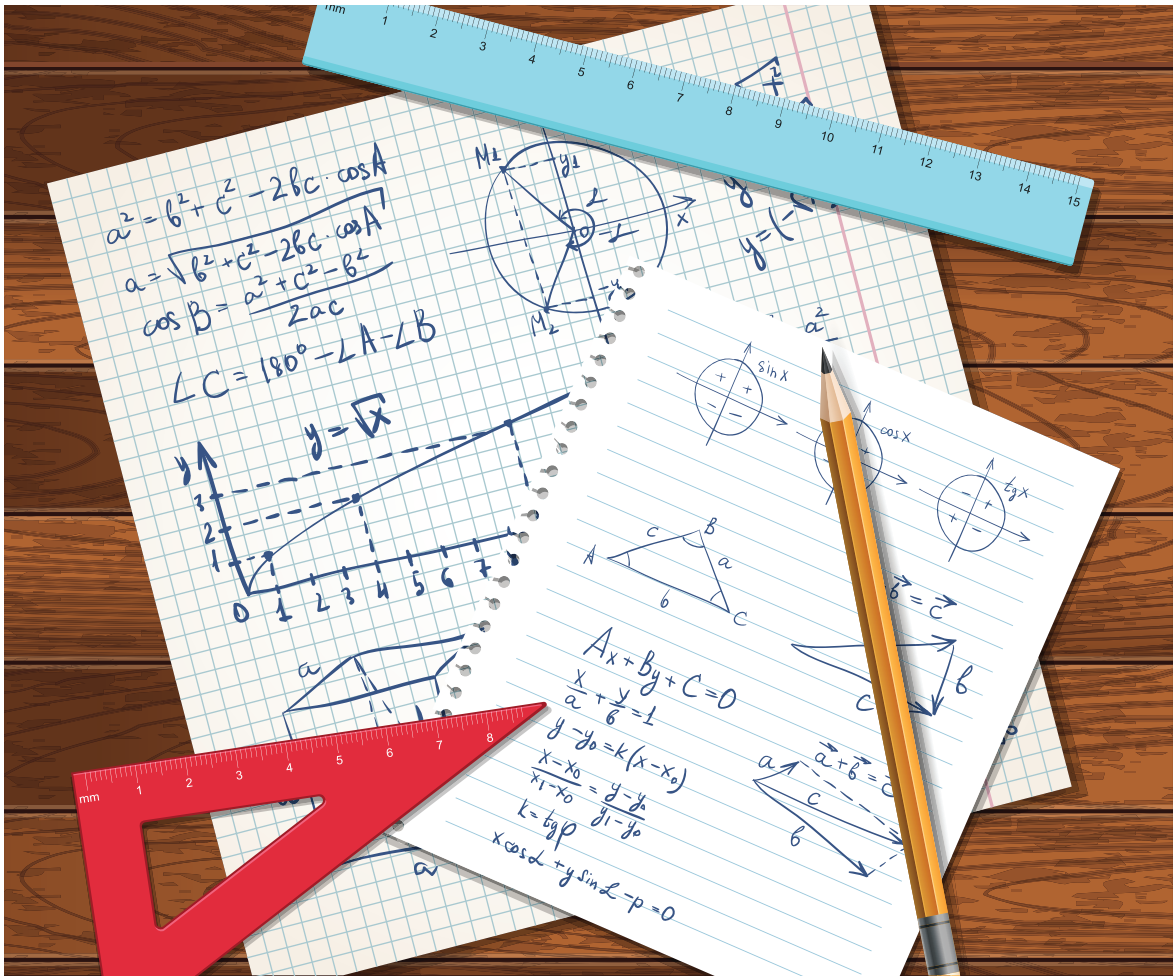

Aims and Scope of the Conference:

The main aim of the conference is; to promote, encourage, cooperate, and bring together researchers in the fields of mathematical science and its applications. All areas of mathematical science will be represented with special emphasis on applications. Conference agenda formatted in such a way to be mathematically enriching and socially exciting. The interest areas of the conference include but are not limited to : Algebra(s) and Applications, Differential Equations, Approximation Theory, Calculus of Variations, Coding Theory, Combinatorics, Control Theory, Cryptology, Geometry, Difference and Functional Equations, Discrete Mathematics, Dynamical Systems and Ergodic Theory, Field Theory and Polynomials, Fluid Mechanics and Solid Mechanics, Fourier Analysis, Functional Analysis, Functions of a Complex Variable, Fuzzy Mathematics, Game Theory, Graph Theory, Group Theory and Generalizations, Integral Equations, Matrix Theory, Mathematical Biology, Mathematical Economics and Financial Mathematics, Mathematical Physics and Math Education.

Intersection of Spiral Disks with Skeletons in Three-Dimensional Coral Space

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In this work we consider the intersection of spiral disks with skeletons in the three-dimensional coral $((\mathrm{CS}),\rho)^3$-space.

Theorem 1. *Let* $\Theta=\Theta_1\cap\Theta_2=\left(\operatorname{int}\Theta_1\setminus\bigcup\limits_{i=1}^{s_j}\operatorname{disk}(\alpha_{ij})\right)\bigcap\left(\operatorname{int}\Theta_2\setminus\bigcup\limits_{i=1}^{t_k}\operatorname{disk}(\beta_{ik})\right)$ *be a small spiral disk lying in a geometric curvilinear 3-simplex of* μ*-skeletons* Ω^μ *which is a triangulation of the three-dimensional coral* $((\mathrm{CS}),\rho)^3$*-space* ($\mu\leq 3$). *And, let* $\operatorname{cl.disk}(\gamma_1)$ *be the closure of the resulting spiral disks on the wild sphere* $\mathcal{S}^2=\operatorname{bd}\mathcal{S}^3\setminus\bigcup\limits_{l=1}^{m}\operatorname{bd}(\operatorname{cl.disk}(\gamma_l))\subset\operatorname{bd}\Theta$ *in* $\operatorname{int}(\operatorname{cl.disk}(\gamma_1))$. *Then the homeomorphism* Θ *is extended to take*

$$(\operatorname{cl.disk}(\gamma_1))\times\left(\left[-\frac{1}{2^{\nu-\eta}},\frac{1}{2^{\nu-\eta+1}}\right]\bigcup\left[\frac{1}{2^{\nu-\eta+1}},\frac{1}{2^{\nu-\eta}}\right]\right)\quad(\eta=1,2,\ldots,\nu)$$

onto the appropriate 3-cells in the geometric curvilinear 3-simplex $\mathfrak{I}^3\in\Omega^\mu$-skeletons.

Theorem 2. *Let* $\Xi_1=\operatorname{cl.}V\setminus\bigcup\limits_{i=1}^{n}(\sigma_i\in\mathfrak{I})\setminus\operatorname{disk}(\xi)$ *and* $\Xi_2=\operatorname{cl.}W\setminus\bigcup\limits_{j=1}^{m}(\sigma_j\in\mathfrak{I})\setminus\operatorname{disk}(\xi_*)$ *are compact sets of spiral disks in three-dimensional coral* $((\mathrm{CS}),\rho)^3$*-space. And, let* $\Sigma=\operatorname{int}\left(\bigcup\limits_{k=1}^{\delta}\aleph_k\right)\bigcap\xi_1$ *be a null sequence of PL 3-balls in* $(((\mathrm{CS}),\rho)^3\setminus\Xi_2)$ *such that* $\operatorname{int}\left(\bigcup\limits_{k=1}^{\delta}\aleph_k\right)$ *covers* $(\Xi_1\setminus\Xi_2)$. *Then* $\Xi_1\bigcup\left(\bigcup\limits_{k=1}^{\delta}\aleph_k\right)$ *is an expansion of* Ξ_1 *in* $(((\mathrm{CS}),\rho)^3\setminus\Xi_2)$.

Theorem 3. *Let* $\operatorname{disk}(D)\subset((\mathrm{CS}),\rho)^3$ *be a compact spiral disk consisting in the coral* $((\mathrm{CS}),\rho)^3$*-space, connected 3-manifold whose boundary contains no 2-sphere. Then there is a knot* $K_n(\operatorname{disk}(D))\in\operatorname{disk}(D)$ *such that every knot* $K_n(\operatorname{disk}(D_1))$ *isotops into a regular neighborhood of* $K_n(\operatorname{disk}(D))\in\operatorname{disk}(D)$ *if and only if* $\operatorname{disk}(D)\subseteq((\mathrm{CS}),\rho)^3$ *is homeomorphic to* $\operatorname{disk}(D^3)\subseteq\operatorname{ball}^3_{((\mathrm{CS}),\rho)^3}(B)\subseteq((\mathrm{CS}),\rho)^3$.

AMS Classification: 52A15; 52A23; 57Qxx; 57Q91.

Key words: geometric curvilinear 3-simplex, PL 3-balls, spiral disks, wild sphere, triangulation, 2-sphere, 3-manifold.

Estimation of the Parameters in a Three Linear Regression Equations System with Multicollinear Exogenous Variables

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An analysis of estimation techniques for just-identified multicollinear exogenous variables of a simultaneous equation system is presented. The model is tested for multicollinearity. A simulation study conducted for the purpose of the analysis revealed the superiority of the full-information estimation method over its counterpart in estimating the parameters of interest. Although, with increased replication, the OLS estimator is the most preferred among the estimators in estimating all the model parameters for a scenario of relatively highly positively correlated.

Keywords: multicollinearity, estimation methods, simultaneous equation model, Monte-Carlo study, OLS estimator.

New Fractional Weighted Montgomery Identity and Ostrowski Type Inequalities

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In this work, we establish a new weighted Montgomery identity for Riemann-Liouville fractional integrals. Then using this new fractional Montgomery identity, we obtain some new fractional inequalities of Ostrowski type.

Radioactive Materials Dispersion in the Atmosphere

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The artificial radionuclides may result from physical processes involving nuclear fission, nuclear fusion and neutron activation. A variety of systems and processes may introduce radioactivity into environment. The physical and chemical dispersion of radionuclides may vary depending on the release and transport conditions in addition to the elements properties. The most serious dispersion of radioactive materials in the environment is related to escaping of noble gases, halogens and aerosols of non-volatile radioactive materials from the reactor containment in the event of a severe reactor accident. Here we try to make a mathematical simulation of radionuclide dispersion in the environment by matching the mathematical tools and the technical data of the nuclear reactors. This simulation may help in the determination of radiation dose the public may be exposed to during a severe reactor accident. A demonstration of the international atmosphere is carried out, the demonstration results are compared with real data taken from the field.

Approximate Solution of a Differential Equation Using Complex Harmonic Spline Functions

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We define a complex harmonic spline function which provides high accuracy to the approximation as compared with other well known methods. The

introduced complex spline approximations apply to the solution of a differential equation. Let Γ be the unit circle, and $\Delta : \ z_0, z_1, \ldots, z_m$ be points on Γ in the counterclockwise order and $\Phi_n(\Delta)$ denote the family of complex splines of degree n with knots Δ. To transform the unit circle Γ to the whole real axis, the points $\{z_j\}_0^m$ are mapped onto

$$\{x_j\} = -\infty < x_0 < x_1 < x_2 < \cdots < x_m < +\infty, \quad x_j = \frac{i(1+z_j)}{1-z_j}, \ j = \overline{0,m}.$$

Assume $S \in \Phi_n(\Delta)$ satisfies the conditions:
i) $S \in \pi_n$ on $\gamma_j, \ j = \overline{0,m}$,
ii). $S \in C^{n-1}(\Gamma)$,
where π_n represents the family of polynomials with complex variable $z = e^{i\theta}$ of degree n and γ_j is the circular arc defined by $\gamma(z_j, z_{j+1})$.

A New Geometric Approach for Ordering Triangular Fuzzy Numbers

Emrah Akyar
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Coauthor: Handan Akyar

In this study, we propose a new method for ordering triangular fuzzy numbers based on the Nagel point of a triangle, which is the point of intersection of the line segments from the vertices of the triangle to the points of tangency of the opposite excircles. Some comparative examples are also given to illustrate the advantages of the proposed method.

Exact Constants for the Best Approximation on the Group $SU(2)$

Essa Aghdassi Alamdarri
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In the present paper we study the properties of the least upper bound of the best approximation by algebraic polynomials in the metrics L^1 and L^∞ for classes of convolutions defined on the group $SU(2)$.

The exact constants for the best approximation by trigonometric polynomials in $L^\infty(-\pi, \pi)$ are studied by many authors. Finally in this paper we prove that for the group $SU(2)$ an analogue of the Favard-Akheizer-Krein theorem does not hold.

Some Methods for Solving Boundary Value Problems for Fractional Differential Equations

Lyazzat T. Aldibayeva
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Coauthor: Nulahemaiti Bahaerguli (Yili Normal University, Gulja, People's Republic of China)

This work considers nonlinear fractional differential equations, there are a few definitions and proofs of theorems. also considered Continuous functions and complete continuity of the operators are also considered, that proved on the basis of some theorems.

ε-Closed Sets

Talal Ali Al-Hawary
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Our goal in this talk is to introduce the relatively new notions of ε-closed and ε-generalized closed sets. Several properties and connections to other well-known weakly and strongly closed sets are discussed. ε-generalized continuous and ε-generalized irresolute functions and their basic properties and relations to other continuities are explored.

An Iterative Approach for the Numerical Solution of a BVP That Arises in Chemical Reactor Theory

Heba Al Kafri
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Coauthors: Suheil Khoury and Ali Sayfy

A numerical algorithm is derived and implemented to approximate the solution of a second order differential equation that governs the steady state model in an adiabatic tubular chemical reactor. The proposed strategy employs the Green's function solution of the corresponding linear term of the differential equation which is to be manipulated to define an integral operator to which Mann's fixed point scheme is applied. Validation of the introduced method is demonstrated by solving the equation for various selected values of the parameters that appear in the model. Residual error computation is adopted to confirm the accuracy of the resulting approximations. Finally, the results are compared to those obtained by other numerical methods that were applied to the model under investigation.

Geometric Integrators with Applications to Hamiltonian Systems

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Coauthor: Anwar Hussein

Geometric numerical integration is a relatively new area of numerical analysis. The aim is to preserve the geometric properties of the flow of a differential equation such as symplecticity or reversibility. A conventional numerical integrator approximates the flow of the continuous-time equations using only the information about the vector field, ignoring the physical laws and the properties of the original trajectory. In this way, small inaccuracies accumulated over long periods of time will significantly diminish the operational lifespan of such discrete solutions. Geometric integrators, on the other hand, are built in a way that preserve the structure of continuous dynamics, so maintaining the qualitative behaviour of the exact flow even for long-time integration.

The aim of this thesis is to design efficient geometric integrators for Hamiltonian systems and to illustrate their effectiveness. These methods are implicit for general (non-separable) Hamiltonian systems making them difficult to implement. However, we show that explicit integrators are possible in some cases.

Both geometric and non-geometric integration methods are applied to several problems, then we do a comparison between these methods, in order to determine which of those quantities are preserved better by these methods. In particular, we develop explicit integrators for a special case of the restricted 3-body problem known as Hill's problem.

Polyharmonic Functions with Negative Coefficients

Khalifa Al-Shaqsi
Nizwa College of Technology
Coauthor: Rana Al-Khal

A $2p$ times continuously differentiable complex-valued mapping $F = u+iv$ in a domain $D \subset \mathbb{C}$ is polyharmonic if F satisfies the polyharmonic equation $\Delta^p F = 0$, where $p \in \mathbb{N}^+$ and Δ represents the complex Laplacian operator. The main aim of this paper is to introduce subclasses of polyharmonic mappings. Coefficient conditions, distortion bounds, extreme points of these subclasses are obtained.

On a Time Discretization Scheme for the Fractional Stochastic Burgers Equation

Zineb Arab
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Coauthor: Latifa Debbi

In this work, we investigate the temporal approximation of the fractional Burgers equation perturbed by a multiplicative cylindrical white noise. More precisely, we elaborate a numerical scheme to approximate temporally the mild solution of this type of equations. In particular, we use the implicit Euler scheme and we prove that the achieved scheme is of order in probability, in addition we calculate explicitly the rate of convergence and we show its dependence on the fractional power of the Laplacian.

Keywords: fractional Laplacian, stochastic Burgers equation, space-time white noise, implicit Euler scheme, order in probability, strong convergence.

Some Methods and Assessment of Course of Mathematics in Primary Schools

Berik Arehbay
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Coauthor: Nai-Qing Song

This scientific-pedagogical study examines some of the techniques that make it possible to assess the methodology of the mathematics in primary school. At the entrance to the work instruments used for the implementation of the goals and feasibility of curriculum were applied. Our researchers would open wide and analyze methods of teaching mathematics as interesting as possible, able to bring the importance of the subject for pupils, teachers and parents. The result turned out to be competent in the plans and objectives of the evaluation tools used for achieving and aspirations of all the goals. The materials developed in this work were interpreted, analyzed using qualitative research methods for positive and negative categories. Experiments were carried out in some primary schools. This study is an attempt to identify the existing situation or deficiencies in the method of teaching mathematics in primary school..

Comparison of Technologies for Parallel Text Processing

Sanzhar Aubakirov
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Coauthors: Paulo Trigo, Mussina Aigerim

The task we address in this paper is to compute statistical information of n-grams. This is a big computational task if you have to process a lot of text data, but it is very well parallelized. Nowadays there is a lot of different patterns of task parallelizations, different platforms and even different languages that can be used. We implement this task on three different platforms: MPJ

Express, Apache Hadoop and Apache Spark. MPJ Express part was implemented using Java 8 Streams library and MapReduce paradigm and without them. As a result we have speed and efficiency comparison between pure MPJ, MPJ + MapReduce, Apache Hadoop and Apache Spark implemented in Scala.

RDTM on Two-Dimensional and Fifth-Order Time-Fractional Partial Differential Equation

Muammer Ayata
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Coauthors: Omer Acan, Yıldıray Keskin, Vineet K.Srivastava, Murat Gubeş

In this presentation, the Reduced Differential Transform Method (RDTM) is applied to find an approximate analytical solution of two-dimensional and fifth-order time-fractional partial differential equation. The solutions obtained by this method are in the form of convergent power series. Since there is no need of discretization, linearization and small perturbations in RDTM, it significantly makes the numerical computations shorter. To illustrate the accuracy of the solutions, we compare the results obtained by RDTM with the exact solution by the aid of tables and graphics. The numerical results show that RDTM is very impressive, practical and quite accurate to fractional equations.

GMRES Method for Solving Discretized Incompressible Navier-Stokes Equations

Nabila Azzam
United Arab Emirates University, College of Science, Department of Mathematics, Al Ain, UAE

A discretization technique to a partial differential equations leads to an algebraic system of equations, which are, in general, large and sparse. In

this contribution, we use iterative solution methods of Generalized Minimum Residual (GMRES) type to solve the discretized Navier-Stokes equations. The linear system (the stream function-vorticity form of the equations) is solved at each step by an iterative solution method GMRES. The diagonally scaled momentum equations are solved by GMRES(m), a restarted version of GMRES . Some numerical experiments are presented to illustrate the theory and methodology.

Some Explicit and Asymptotic Formulas Related to the Generalized Arithmetic Triangles

Armen Bagdasaryan
American University of the Middle East, Kuwait

This talk first introduces the m-arithmetic triangle — a generalization of the Pascal's triangle, and then presents an explicit formula for the numbers of the m-arithmetic triangle; some asymptotic expansions for these numbers have also been found. With a new formula for inversion of analytic functions, which we have introduced recently, we get the inversion formulas, in which new special numbers A_n appear. We present a recurrence formula for A_n using an analogue of the Pascal's triangle, a relationship formula between A_n and Bernoulli numbers, and a new explicit formula for Bernoulli numbers. We also give the power series expansions for some elementary functions as well as asymptotic expansions of certain special functions that involve A_n.

Some Methods of Solving Problems in Probability Theory

Nulahemaiti Bahaerguli
Yili Normal University, Gulja, People's Republic of China
Coauthor: Abudissa Abudulla (Yili Normal University, Gulja, People's Republic of China)

The work based on the volume of material to make the final, it is the basic three models for the calculation of probability, and to analyze the type and presented their methods of solution. Classical model can typically be divided into different models, one of them receiving a random pattern of which shows some examples and discussion moves solution.

The Problem of Filtration Theory with Free Boundaries

Zharasbek D. Baishemirov
Abay Kazakh National Pedagogical University, Almaty, Kazakhstan
Coauthors: Gulnar Dildabek (al-Farabi Kazakh National University, Almaty, Kazakhstan), Murat Tilepiev (S. Seifullin Kazakh Agrotechnical University, Astana, Kazakhstan)

The research is dedicated to the classical solvability of the mathematical model of non-isothermal filtration. The mathematical model represents a problem of Stefan type and describes the process of liquid filtering around wellbore area. An algorithm and numerical experiments with real data from field are performed.

Numerical Solution of BVPs: A Novel Approach Based on Green's Functions and Fixed-Point Iteration Schemes

Alaa Bakir
American University of Sharjah
Coauthors: Suheil Khoury and Ali Sayfy

Nonlinear BVPs appear in a wide spectrum of applications, and various numerical algorithms are used to solve them. In this paper, we propose a novel algorithm that is based on embedding Green's function into fixed point iteration schemes, such as Picard's and Mann's, for solving a wide class of BVPs. Numerical examples of second and third order nonlinear BVPs are solved based on this strategy. The reported results demonstrate the efficiency and high accuracy of this method.

Are the Performances of GRNN Models Influenced by the Statistical Properties of the Time Series?

Alina Barbulescu
Higher Colleges of Technology, Sharjah, UAE
Coauthor: Haydar Akça, Abu Dhabi University, UAE

In this article we analyze the performances of GRNN models as a function of their statistical properties. It is proved that only the seasonality has an important influence on the models' quality.

Teaching Our Students to Embrace Their Failures in the Mathematics Classroom

Summer Al-Jarrah Bateiha
Virginia Commonwealth University in Qatar

Mathematics education research suggests that as they progress through school, students in mathematics classrooms often develop a fear of "being wrong". This anxiety may lead them to shut down and not work past mistakes and frustrations when they cannot immediately solve mathematical problems. Many of these students seem to believe that mathematics can only be done in one way — a mysterious way that is reserved for certain "other" individuals ("math people") who are different than themselves. However, research suggests that these beliefs are often false and stem from years of schooling experiences where students were placed under time-restricted pressure to do mathematics and penalized for having incorrect answers on their first attempts to solve problems. In this talk, I will present some research-based ideas for teaching our students to embrace failure and do mathematics in multiple ways, ultimately fostering an environment where more students are comfortable and engaged with the process of solving mathematics problems.

Some Recent Results on the Bresse System

Said-Houari Belkacem
Al Hosn University, Abu Dhabi

In this talk, we discuss some recent results on the Bresse system with damping. We show that one damping alone is not enough to stabilize the solution of the system. Using both the Lyapunov functional and the eigenvalues expansion we prove an optimal decay rate of the solution. These results improve and extend many existing results on the Bresse system.

The Existence of Nontrivial Solutions to a Nonlinear Elliptic Equation

Zahia Belyacine
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Coauthor: Nawel Benouhiba

In this work, we use Col's theorem to show the existence of eigenvalues for this problem.

Generalizations of Kaplansky's Theorem Involving Unbounded Linear Operators

Abdelkader Benali
Faculty of Science Hassiba Ben Bouali University, Chlef, Algeria
Coauthor: Mohammed Hicham Mortad

The purpose of this paper is to generalize a very famous result on products of normal operators, due to I. Kaplansky. The context of generalization is that of bounded hyponormal and unbounded normal operators on complex separable Hilbert spaces, and some examples "spice up" the paper.

Analysis of the Dynamics of a Prey-Predator Model

Karima Bencharif
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Coauthor: Soraya Boughaba

In this work we present a dynamical system and its chaotic behavior. We study the evolution of populations in a continuous-time prey-predator ecological model.

A Spectral Problem for Second-Order Differential Operators with Integral Boundary Condtions

Abdelhak Berkane
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Coauthor: Mohammed Denche

A second-order ordinary differential equation with a spectral parameter and integral conditions is considered. An a priori estimate of the solution for sufficiently large values of the parameter is obtained and spectral properties of the corresponding operator are studied.

Classification: 31A25, 31B20, 34B05, 34G10.

Keywords: second-order ordinary differential equation, integral condition, Fredholm operator.

Initial Value Problems for Integro-Differential Equations with State-Dependent Impulse Effects

Fatima Zohra Berrabah
University Djillali Liabes, Sidi Bel Abbes

By using Schaeffer's theorem, this work investigates the existence of solutions of initial value problems for first-order integro-differential equations with impulse effects.

Admissibility of Set-Open Topologies and Cofree S-Spaces

Abderrahmane Bouchair
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Let S be a topological monoid, X be a topological space and $C(S,X)$ be the set of all continuous functions from S to X. A topology t on $C(S,X)$ is admissible if the evaluation mapping $e : S \times C(S,X) \to X$ defined by $e(s,f) = f(s)$ is continuous. In this work, we study the relationship between the admissibility of the set-open topology on $C(S,X)$ and the continuity of the action of S on $C(S,X)$. We prove that the set-open topology on $C(S,X)$ is admissible if and only if $C(S,X)$ equipped with the set open topology and the action $s \cdot f = (t \mapsto f(st))$ is the cofree S-space over X.

Automatic Differentiation in the Parametrisation of Both Axisymmetric and Non-Axisymmetric Vesicle Shapes

Redouane Boudjemaa
University M'Hamed Bougara of Boumerdes, Boumerdes, Algeria

This paper describes the application of Automatic Differentiation methods in the parametrisation of shapes adopted by fluid membranes and vesicles. Automatic Differentiation techniques, for short AD, are various methods for computing accurately the sensitivities of complicated functions of one or more variables based on the function evaluation algorithm. The smooth surface is produced as a bounded solution of a 6th order partial differential equation. The vesicle shape controlling parameters are introduced through the boundary conditions. Both axisymmetric and non-axisymmetric vesicle shapes are accurately approximated through a gradient-based numerical minimisation of a surface energy model with respect to a range of control variables. The gradient supplied to the minimisation method is computed accurately using AD techniques.

Correlation Function; Path Integral; Variational Method; Systematic Correction

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Feynman Kleinert variational method allows to evaluate, in a satisfactory manner, the energy of the ground state for a given quantum system. To make the method more efficient, Kleinert found it useful to introduce into its starting technique new corrections called systematic and whose contribution seemed to be decisive later. In his new method, Kleinert combines the perturbative and variational methods to express the classical effective potential in the form of a convergent series. The various terms appearing in the final expression for the energy will be calculated through correlation functions.

Determination of the Ground State Energy of Symmetric PT Complex Potential, in the Framework of Feynman Integrals Formalism

Hocine Boukabcha
Khemis Miliana University

Feynman Kleinert variational method [1] allows to evaluate, in a satisfactory manner, the energy of the ground state for a given quantum system. To make the method more efficient, Kleinert found it useful to introduce into its starting technique, new corrections, called systematic and whose contribution seemed to be decisive later. In his new method [1], Kleinert combines the perturbative and variational methods to express the classical effective potential in the form of a convergent series. The various terms appearing in the final expression for the energy will be calculated through correlation functions.

The bulk of the work consists of using algebraic and variational methods with or without systematic corrections to calculate the energy of the ground state of a physical system subject to a PT-symmetric anharmonic potential.

The choice of this family of potentials lies in the fact that they have the particularity to be unsealed but admit, however, real and positive eigenvalues. We have also shown through the matrix method of Feynman formalism of Feynman that a harmonic oscillator subject to linear and complex potential admits the same energy spectrum as a pure harmonic oscillator. The results obtained in each study are fully consistent with those calculated by other methods.

References

[1] H. Kleinert, *Path Integrals in Quantum Mechanics*, Statistics and Polymer Physics and Financial Markets (World Scientific, Singapore, 2004).

Further Results Related to Some Integral Inequalities on Time Scales and Their Applications

Khaled Boukerrioua
University of Guelma, Algeria

The present work's goal is to bring generalizations, refinements and conversions of some classical inequalities of Pachpatte-type and Bellman-Behari model, on time scales, using elementary analytic methods. The given results unify continuous and discrete inequalities and extend some known results in the literature. To show the feasibility of the inequalities obtained, some illustrative dynamical examples are also introduced at the end.

An Algorithmic Finite Element Method for Nonlinear Elliptic Variational Inequalities

Messaoud Boulbrachene
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In this paper, we introduce an algorithmic method to analyze the convergence of the standard finite element method for nonlinear elliptic variational inequalites (VI). An optimal error estimate is derived in the maximum norm,

combining the so-called Bensoussan-Lions algorithm with a contraction fixed point characterization of the solution of the VI.

A New Modified Scheme for Linear Shallow-Water Equations with Distant Propagation of Irregular Wave Trains Tsunami Dispersion Type for Inviscid and Weakly Viscous Fluids

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Coauthors: Abdelhamid Laouar, Allaoua Guerziz, Hossam S. Hassanc

In this work, we propose a modified scheme for simulating irregular wave trains (IWTs) propagation dispersive of tsunami with suitable initial and boundary conditions by applying the alternating direction implicit (ADI) method. The convergence, stability and consistency criteria of the scheme have been studied. We introduce a weakly dissipative terms into improved linear Boussinesq equations (ILBqs) that permits the mathematical tool to simulating a transoceanic propagation dispersive of tsunami in both ocean and laboratory experimental. The new numerical dispersion of the proposed model is manipulated to replace the physical dispersion of (ILBqs) by controlling dispersion-correction parameters. The new model developed in this study is applied to propagation of Heraklion tsunami scenario 1 (HTS1) of the 365 AD earthquake. The resulting scheme is efficient and practical to implement. Furthermore, a comparison between the present results with another existing numerical method has been reported and we found that they are in a good agreement.

Around Quasiconvexity

Omar Boussaid
Hassiba Ben Bouali University of Chlef

In this talk we review some properties of the notion of quasiconvexity, this notion which has been introuced by Morrey in 1952 and play the central role in vectorial calculus of variations. We give the essential characteristics of this notion for sets and functions, some relaxation problems will be also considered.

An Iterative Regularization Method for an Abstract Ill-Posed Biparabolic Problem

Nadjib Boussetila
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Coauthor: Abdelghani Lakhdari

In this talk, we are concerned with the problem of approximating a solution of an ill-posed biparabolic problem in the abstract setting. In order to overcome the instability of the original problem, we propose a regularizing strategy based on the Kozlov-Mazya iteration method. Finally, some other convergence results including some explicit convergence rates are also established under a priori bound assumptions on the exact solution.

On the Unit Group of a Commutative Group Ring

Victor Bovdi
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Let $V(RG)$ be the group of normalized units of the group ring RG of a finite abelian p-group G over a commutative ring R of characteristic p^e with $e \geq 1$. The structure of the group $V(RG)$ has been studied by several authors (see the survey [1]). For a finite abelian p-group G, the invariants

and the basis of $V(\mathbb{Z}_pG)$ have been given by R. Sandling (see [3]). In general, when $\mathrm{char}(R) = p^e$ with $e \geq 2$, the structure of the abelian p-group $V(RG)$ is still not understood.

In our talk we give the invariants of $V(RG)$ in the case when $R = \mathbb{Z}_{p^e}$ is the ring of residues modulo p^e and G is a finite abelian p-group (see [2]).

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Stability and Density Analysis of Glioblastoma (GB) with Piecewise Constant Arguments

Fatma Bozkurt
Erciyes University

This study is concerned with the following brain tumor growth model with a piecewise constant argument:

$$\frac{dx(t)}{dt} =$$

$$x(t)\{r(1-\alpha x(t)-\beta_0[t]x([t])-\beta_1[t-k]x([t-k]))-\gamma_1[t]x([t])-\gamma_2[t-k]x([t-k])\},$$

where the parameters α, β_0, β_1, γ_1, γ_2 and r belong to $\mathbb{R}_+$, $[t]$ is the integer part of $t \in [0,\infty)$ and $k \in \mathbb{N}$. γ_1 is included to show the effect of the treatment on the tumor, while γ_2 represents the rate that causes a negative effect from the immune system to the tumor population. In this work we have constructed two models; in the first one we consider a monoclonal growth around the positive equilibrium point, in the second one, we analyzed the growth in case of early detection of the tumor.

A Numerical Study in a Carbon Dioxide Membrane Permeator

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Coauthors: Hameed Muhamed, Chemical Engineering Department, Abu Dhabi University and Dalila Hunk, Ecole Polytechique, Algiers, Algeria

The emission of CO_2 has been increasing steadily and reached the critical concentration of 400 ppm in 2013 for the first time. CO_2 removal from the sources such as fossil-fuel power plants and similar sources is of paramount importance to these industries and to reduce the effect on global warming. The aim of this study is to find out the optimum membrane area for symmetric and asymmetric membranes in order to remove the carbon dioxide from natural gas prior to liquefaction. A calculation method for predicting the gas separation performance of a permeator is presented. The numerical study evaluates the surface area required for the minimum concentration of carbon dioxide. This concentration should match with the requirement of the concentration of carbon dioxide allowed as input in liquefaction technology. The gas mixture was used in concurrent and countercurrent flow pattern with nitrogen as sweeping gas in the permeate side. Operating conditions and membrane system structures were optimized

Exponentials of Bounded Normal Operators

Aicha Chaban
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Coauthor: Mohammmed Hichem Mortad

The present paper is mainly concerned with equations involving exponentials of bounded normal operators. Conditions implying commutativity of those normal operators are given. This is carried out without the known $2\pi 2\pi$-congruence-free hypothesis. It is also a continuation of a recent work by the corresponding author.

Full Discretization of the Wave Equation

Abderezak Chaoui
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Coauthors: Fateh Ellaggoune and Assia Guezane-Lakoud

Rothe's method for time discretization and Crouseix-Raviart nonconforming finite element method with respect to the spatial variable are used. After introducing error estimators, we prove the equivalence between the error and its indicators.

Integral Inequalities and the Calculus of Variations

Wing-Sum Cheung
The University of Hong Kong

The classical approach of solving variational problems resorts to the Euler-Lagrange Equations, which are in general a system of higher order nonlinear differential equations and is in general very difficult to tackle. For certain types of variational problems, the use of suitably devised integral inequalities could lead to optimal solutions effectively without having to consider the Euler-Lagrange Equations. A few examples of this approach will be given in this talk.

Some Properties of Q_1-Reducibility

Irakli Chitaia
Departament of Mathematics, Iv. Javakhishvili Tbilisi State University,
Tbilisi, Georgia

The notion of Q-reducibility is very natural and important for the Theory of Algorithms. A lot of interesting properties of Q-reducibility are obtained while very few is known about Q_1-reducibility. In this talk we will present some recently obtained results about structural properties of Q_1-reducibility.

A New Diagonal Sampling Method for Global Optimization

Lakhdar Chiter
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The DIRECT (DIviding RECTangles) algorithm is an efficient deterministic sampling method for Lipschitz continuous function optimization where very little might be known about the objective function. The algorithm adopts a center sampling strategy according to a specific protocol of dividing the search area, but it has some drawbacks, especially when the global minimum lies at the boundaries, and therefore the convergence will be slow. To overcome this disadvantage, we propose a modification of the original DIRECT for multidimensional problems. We adopt a diagonal 2-point sampling method and a new definition of potentially optimal hyperrectangles is derived. The method is illustrated and tested on several standard test functions.

Existence of Periodic Solutions for the Discrete Counterpart of a Neutral-Type Cellular Neural Network with Time-Varying Delays

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For a cellular neural network with time-varying delays a discrete counterpart is obtained by a modification of the semi-discretization method. For the resulting system sufficient conditions are found for the existence of at least one periodic solution by using Mawhin's continuation theorem.

A High-Order Finite Difference Schemes for Solving Linear Black-Scholes

Mohamed Dalah
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In this work we try to apply the high-order finite difference schemes for solving linear Black-Scholes. First, we put the continuous problem with all boundary conditions. In the second step, we discretize this problem by using high-order finite difference schemes. Finally, we write some codes in Matlab which illustrate these financial phenomena.

Quadratic Approximation Based ABC for Unconstrained Optimization

Kedar Nath Das
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In this paper, an attempt is made to hybridize Artificial Bee Colony (ABC) algorithm with a technique that finds the minima of the quadratic surface passing through three different points called 'modified quadratic approximation' in order to get rid of stacking in the local optima. Secondly in ABC, there is a chance of losing the best individuals achieved so far by reinitializing the population, while no further improvement is found in the solution. To avoid it, a modification in scout bee activity is also proposed in this paper. The proposed algorithm is named as quadratic approximation based ABC (qABC). The better efficiency of qABC over the recent variants of ABC is analyzed through a set of 26 unconstrained benchmark problems. The numerical and graphical results confirm the better strength of qABC.

Asymptotic Estimates of the Solutions of Boundary Value Problems for Singularly Perturbed Integro-Differential Equations

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The boundary value problem for linear singularly perturbed integro-differential equations is considered. An analytic formula and asymptotic estimation of the solution and its derivatives are obtained. It was found that the solution of the boundary value problem under consideration at the left endpoint of the segment has an initial jump phenomenon. It is proved that the solution of the singularly perturbed boundary value problem converges to the solution of a modified degenerate problem.

A Polygonal Method for a Second-Derivative Lagrangian

Ahmed Diaf
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We develop a matrix approach to calculate the exact propagator related to the Lagrangian having an acceleration term in addition to the usual term. The quantum mechanical system is defined for Euclidean time using the path integral formalism. This technique leads us to a fourth-order differential equation whose solution will be in terms of the Greens functions. The propagator is completely defined by the knowledge of the phase and the normalization constant.

Keywords: Polygonal method; path integral; Green function.

Regularization and Error Estimates of a Nonlinear Abstract Backward Cauchy Problem

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In this paper, we present a new modified regularization method for an abstract nonlinear backward Cauchy problem, known also as final value problem (FVP). This problem is known to be severely ill-posed. The used regularization method yields a well-posed family of approximate problems. An estimation of the regularized solution is established and some error estimates and comparison results are also provided.

Keywords: Ill-posed problem; backward Cauchy problem; quasi-boundary value method; quasi-reversibility methods.
MSC Classification (2010): 35K99, 47J06.

On The Hyper-order of Solutions of Nonhomogeneous Linear Differential Equations

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In this paper, we study the hyper-order of solutions of higher order linear differential equations with entire or polynomial coefficients. We improve previous results given by Xu and Cao.

Existence of Positive Solutions for Singular Fifth-Order Three-Point Boundary Value Problem

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In this article, we consider the boundary value problem $u^{(5)}(t)+f(t,u(t))=0$, $0<t<1$, subject to the boundary conditions $u(0)=u'(0)=u''(0)=u'''(0)=0$ and $u'''(1)-\alpha u'''(\eta)=\lambda$. In the setting $0<\eta<1$ and $\alpha\in[0,1)$ are constants and $\lambda\in[0,+\infty)$ is a parameter. By placing certain restrictions on the nonlinear term f, we prove the existence and nonexistence of at least one positive solution to the boundary value problem with the use of the Krasnosel'skii fixed point theorem. The novelty in our setting lies in the fact that $f(t,u)$ may be singular at $t=0$ and $t=1$. We conclude with examples illustrating our results obtained in this paper.

On the Pricing of Options in Jump Diffusion-Illiquid Markets — A Monte Carlo Approach

Youssef El-Khatib
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In this work we deal with the options pricing problem in an illiquid market with jumps. The underlying asset price process is driven by a Brownian motion and an independent compensated Poisson process. Under these assumptions, the market is incomplete. The risk neutral theory insures that the value of an option can be written as an Expected value. We simulate the underlying asset price process using an Euler-Maruyama scheme for a stochastic differential equation. Then, the Monte Carlo method is applied to evaluate numerically the expectation that gives the value of European option prices.

Stability of General A-Cubic Functional Equations in Modular Spaces

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In this paper, by using the fixed point theory, we investigate the generalized Hyers-Ulam stability of the functional equation

$$f(\alpha x+y)+f(\alpha x-y)+f(x+\alpha y)-f(x-\alpha y) = 2\alpha f(x+y)+2\alpha(\alpha^2-1)[f(x)+f(y)],$$

with $\alpha \in \mathbb{N}$, $\alpha \neq 1$ in modular spaces.

Optimization of Conjunctive Use of Water in Lower Bhavani Basin, India, Using GA and MODFLOW

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For studying the future of surface water and ground water resources a new MODFLOW package (Nonlinear Flow Process; NLFP) is implemented. In this study, for surface water the stream flow is converted into a set of comparatively regular flow and for groundwater, the pumping rates were adjusted to suit the aquifer properties with the sustainable recharge. The optimization for conjunctive use of water in Lower Bhavani Basin is carried using genetic algorithm (GA) with the help of Modified Groundwater Optimizer (MGO). The ground and surface water potential had been estimated using Visual MODFLOW. Different scenarios of recharge were considered. When the recharge is 5% of the annual rainfall, then the rate of recharge is 152420 m^3/day. For 10% of annual rainfall, the rate of recharge is 323010 m^3/day. For 15% it is 430720 m^3/day and for 20% it is 646470 m^3/day respectively. From the optimized output it is found that the overpumping in the wells leads to the reduction in the amount of pumping in the adjacent wells. A scenario considering a transient flow in a more realistic setting and a larger model domain with a higher number of cells demonstrates that NLFP

performs well under more complex conditions. Thus, this new tool opens a field of opportunities to groundwater flow simulation with MODFLOW, especially for core sample simulation as well as for nonlinear flow in the vicinity of pumping wells.

Theorem of Wiener Chaos in the Sublinear Expectation Space

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Recently Peng proposed a new framework of a sublinear expectation space under which he introduced a G-Brownian motion. The theory of sublinear expectation is intrinsic in the sense that is not based on a given linear probability space. This has given us hope to develop stochactic calculus where we establish some properties of G-stochastic multiple integrals. Then we prove the equivalent theorem of Wiener chaos with respect to G-Brownian motion in the sublinear expectation space.

Regression Model with Correlated Errors Based on Functional Random Design

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This paper deals with the study of the estimation of the functional regression operator when the explanatory variable takes its values on some abstract space of functions. The main goal of this paper is to establish the exact rates of convergence of the mean squared error of the estimator when the errors come from a stationary process under long or short memory and

based on random functional data. Moreover, the theoretical results obtained are checked through some simulations with regular (smooth) and irregular curves and then with real data.

Keywords and phrases: Random functional data, kernel estimator, small ball probability, short and long memory process, asymptotic distribution, ARFIMA and Ornstein-Uhlenbeck process, negatively associated process.

Inequalities for Fibonacci Hyperbolic Functions and Their Applications

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A basic theorem is established and found to be a source of inequalities for Fibonacci hyperbolic functions, such as the ones of Cusa, Huygens, Wilker, Sandor-Bencze, Carlson, Shafer-Fink type inequality, and the one in the form of Oppenheim's problem. Moreover, these inequalities described above will be extended by this basic theorem.

On Complete Boolean Algebras and Isometries of Bochner Spaces

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In this article we are characterizing the surjective isomorphisms of complete Boolean algebras in terms of the onto homeomorphisms of their Stone spaces. It turns out that each surjective isomorphism of a complete Boolean algebra is completely determined by a homeomorphism of its Stone space onto itself and, vice versa. Then we use the results obtained to improve further the known characterization of the linear isometries on Bochner spaces of Hilbert space-valued measurable functions.

2010 AMS Classification: 46E40, 28B05, 47B38.
Keywords: complete Boolean algebra, linear isometry, Bochner space.

On the Transmission of Information Using Coupled Hadamard Rhotrix Matrices

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In the present paper, we use Hadamard Rhotrices with their coupled matrix as generator matrix to construct a binary linear block code. The standard generator matrix and the parity check matrix are given for this code. Finally, the Syndrome decoding method is used to correct errors which appear in transformation information, and we give an example to explain how this method works by using MATLAB program.

Boundary Conditions for 1-set Contraction Maps in Banach Spaces

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In this work, we have obtained some fixed point theorems for 1-set contractions under some boundary conditions such as the Leray- Schauder condition and the interior condition.

Existence Solutions for a Nonlinear Differential Equations of Arbitrary Order

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The theory of differential equations of fractional order arises in many scientific disciplines, such as physics, chemistry, electrochemistry, control theory, image and signal processing, biophysics. For more details, we refer the reader to [2, 3, 4, 5] and references therein. There has been a significant progress in the investigation of these equations in recent years (see [1, 2, 5]). More recently, some basic theory for the initial boundary value problems of fractional differential equations has been discussed in [1, 5, 2]. In [4], the existence and uniqueness of solutions was investigated for nonlinear fractional differential equations with integral boundary conditions by using Schauder and Krasnoselskii's fixed point theorem. In this work we study the existence and uniqueness of solutions of a fractional boundary value problem of nonlinear differential equations of arbitrary orders. New existence and uniqueness results are established using Banach contraction principle. Other existence results are obtained using Schaefer and Krasnoselskii's fixed point theorems.

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On Engliš Algebras and Berezin Symbols

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We study some results related with statistical radial limit for operators. We give some properties of Engliš algebra and obtain some results concerning Berezin symbols.

This work is supported by Süleyman Demirel University with project 4434-D1-15.

Chaos for Graph Maps

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Let G be a graph and f be a continuous function from G to itself. We study some types of chaotic function on a graph and find the relation between them. We also introduce a new type of chaos defined on a graph called strongly chaotic and a characterization the generically chaotic and densely chaotic on graph maps.

On a Fictitious Method Approach to the Model of Inhomogeneous Viscous Incompessible Fluid

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A fictitious method approach to the model of inhomogeneous viscous incompessible fluid is proposed. The existence of the solution of the approximating problem is established. The estimate of convergence of the solution of the approximating problem to the solution of the source problem is given.

A Classification of Noether Symmetries for the Wave Equation on CSS Manifolds

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Symmetry analysis of a wave equation on a class of cylindrical symmetric static (CSS) space-times is performed. The results are classified according to the Noether symmetries and metrics spaces. It is well known that the standard wave equation in a flat space is a linear equation.

Nonlinear equations and, in particular, nonlinear wave equations arise by the model under study or, usually, via the medium that the wave operates on. Also, nonlinearities may be studied by imposing the wave equation and, indeed any equation of physics (where possible), on a curved manifold.

Symmetry algebras are found in flat and in non-flat background metrics. It turns out that the wave equation on these metrics admits Noether symmetry groups of dimension 5, 6, 7, 8 and 12.

Periodic Solution of Filtration Problem of Stefan Type

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We have investigated the periodic solution of the problem of the theory of non-equilibrium filtration, the existence of periodic solutions close to the quasi-stationary one, the relation between the pulling rate fluctuations and the spatial frequency distribution of impurities, and constructed computational algorithms for numerical implementation with respect to this problem.

Numerical Modeling of the Process of Non-Equilibrium Sorption

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Filtration in porous media of fluids and gases containing associated with them (dissolved, particulate) solid substances, accompanied by the diffusion of these substances and mass transfer between the liquid (gas) and solid phases is considered. The most common types of mass transfer are sorption and desorption, ion exchange, dissolution and crystallization, mudding, sulfation and suffusion, waxing. We consider the system of equations modeling the process of non-equilibrium sorption. A difference approximation of differential problem by the implicit scheme is formulated. The solution of the difference problem is constructed using the sweep method. Based on the numerical results we can conclude the following: with a decrease in the relaxation time of the non-equilibrium problem solution it tends with time to the solution of the equilibrium problem.

Forecasting Mortality Rate of Malaysia Using Lee-Carter Extension of Hynman-Ullah and Booth-Maindonald-Smith and Its Statistical Comparison Analysis

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Observing mortality pattern and trend is an important subject for any country to maintain a good social-economy in the next projection years. The declining in mortality trend gives a good impression of what government has done towards macro citizen in one nation. Selecting a particular

mortality model can be tricky based on the approached method adapting. Lee-Carter model is adapted because of its simplicity and reliability of the outcome results. Implementation of Lee-Carter in finding a fitting model and hence its projection has been used worldwide in most of mortality research in developed countries. This paper studies the mortality pattern of Malaysia using Lee-Carter extension Hynman-Ullah and Booth-Maindonald-smith. The mortality data is indexed by age of death and year of death from 1984 to 2012, which are supplied by Department of Statistics Malaysia. The modeling results are modeled using R-Programming and the keen statistical analysis will focus comparing these two different methods using Malaysia's mortality data. This paper can be extended to other variants extensions of Lee-Carter.

Exploring the Vice of Intoxicants and Their Impacts on Health through Logistic Model

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Medical literature is replete with the vice of addiction to cigarettes, drugs, alcohol, processed food etc. In fact, there is even medical evidence to suggest that teetotalers and those who abstain from the use of intoxicants and drugs live longer. Even though people are very well aware of the harmful effects, they choose to turn a blind eye to these fatal toxic/harmful materials and consume them in large quantities. There is a stark increase in the detriment of a large population with the modernising society and the easy availability of drugs which needs light to be thrown upon. The alarming adverse effects need to be subjected to scrutiny.

A sample survey was conducted among the patients who were a part of examination by the team of physicians, which included the researcher as a medical student, during the period from February 2015 to May 2015 at Navi Mumbai hospital. Cross-sections of selected patients representing different age, religion and caste who constituted a total of 400 were subjected to examination on the basis of their response to a finely drafted questionnaire. A mathematical model namely logistic regression is developed based on the survey so as to bring to light the insights, which could leave even the best physicians surprised.

Introspecting 3D Printing through Vector Autoregression Technique

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Though an engineering perspective, 3D Printing enjoys wide popularity thanks to nits applicability among various disciplines such as Engineering, Medical Science, Manufacturing, Geography, History Science, Engineering, Architecture, Education, Medical Science and Social science streams where it could be a useful tool. 3D Printing is an innovative technology that is now being used for simulation, research, prototype production and even manufacturing. In depicting the applications of this technology it is evident that digital changes can affect the physical world as observed in the applications of 3DP.

The technique of VAR, which is a multiple time series modeling approach is used for the purpose of this research. Three variables such as the ratio of patent granted to patent application for 3D printer, GDP growth rate of G7 countries and investment as a ratio of GDP of G7 are used here. For in this analysis the data of G7 countries has been used and taken from IMF database and World patent office. The analysis is performed with time series data from 1982 to 2012 of all the three variables. VAR model equations, apart from forecasting, are also used to simulate the effect of sudden change (impulse) in one variable on other variables, by generating Impulse Response Function (IRF). It enables us to estimate the time scale over which the effect of change in the patent ratio leads to variations in the concentration of other variables. Another application of the VAR model is variance decomposition that deals with forecast error variance as brought out by way of this analysis.

Symmetry and Conservation Law Structures of Some Anti-Self-Dual (ASD) Manifolds

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The ASD systems and manifolds have been studied via a number of approaches and their origins have been well documented. In this presentation,

we look at the symmetry structures, variational symmetries and related concepts around the associated conservation laws for a number of such manifolds.

Numerical Solution of the Inverse Problem of Filtration Theory by Modeling Functions

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One of the important tasks in the oil and gas sector is the problem of determining the parameters of the formation of the observed values of pressure, saturation, and others with monitoring wells. This paper deals with the numerical solution of the inverse problem of determining the permeability of the porous medium equation for unsteady filtration of a homogeneous liquid in an elastic nonhomogeneous porous medium. The idea of using the method of modulating functions for the solution of inverse problems goes back to J. Loeb and D. Kahena.

Effect of Construction, Meteorological and Operational Parameters on the Fresh Water Yield of a Condensation Chamber of a Modular Solar Still

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Desalination is one of many processes available for water purification, and sunlight is one of several forms of energy that can be used to power the process. Although of simple design, the basin solar still gives a low daily production. So many techniques have been used to improve the performance of such still. For instance, by coupling the basin solar still with a flat plate,

parabolic concentrator collector, vertical flat plate reflector and the reuse of the latent heat of condensation.

The separation of the evaporation chamber from the condensation leads to a higher temperature difference between the glass cover and the brackish water and consequently, a decrease in pressure of water vapors compared to that of conventional still results. The absence of condensate on the cover increases the solar radiation absorbed by the bottom of the still, thus generating an increase in the distilled water amount.

In this paper, we present the effect of different parameters construction (height and width of the condensation chamber), meteorological (relative humidity) and operational (cooling water flow rate) on the fresh water production of a condensation chamber of a modular solar distillation system working in natural convection mode. This still is comprised of two modules. The first is a streaming plan solar collector and the second is a condensing chamber. Equations governing the heat and mass exchange are established using the nodal method. Transfer equations are solved using a numerical implicit finite-difference scheme method. An iterative calculation is necessary because the heat and mass transfer coefficients depend on the temperatures of the different media which are unknown. Moreover, the air flow through the still depends on the air temperature at the still outlet. It is also necessary to use an iterative method for the calculation of this flow.

Results show that increasing different parameters leads to a great fresh water yield, on the one hand. On the other hand, there is a cooling water flow rate and a first compartment height value for which any increase leads to a weak augmentation to the fresh water yield.

The Decay Rate of Solutions for the Cauchy Problem in Timoshenko System with Past History

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We consider the Cauchy problem for the one-dimensional Timoshenko system coupled with the heat conduction, wherein the latter is described

by the Gurtin-Pipkin thermal law. We study the decay properties for the system using the energy method in the Fourier space (to build an appropriate Lyapunov functional) accompanied with some integral estimates. We show that the number α_g (depending on the parameters of the system) which rules the evolution in bounded domains, plays a role also in unbounded domains and controls the behavior of the solution. In fact, we prove that if $\alpha_g = 0$, then the L_2 norm of the solution decays with the rate $(1+t)^{-1/12}$. The same decay rate has been obtained for $\alpha_g \neq 0$ but under some higher regularity assumption. This high regularity requirement is known as regularity loss, which means that in order to get the estimate for the H^s norm of the solution, then we need our initial data to be in the space H^{s+s_0}, $s_0 > 1$.

An Improved Nonlocal Boundary Value Problem Method for an Abstract Ill-Posed Biparabolic Problem

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In this talk, we propose an improved nonlocal boundary value problem method to solve an ill-posed biparabolic problem. The idea of the N.L.B.V.-method is replacing a boundary value problem with an approximate nonlocal well-posed problem to construct approximate solutions of the original ill-posed boundary value problem. We give some estimates for the solution of the regularized problem, and we also show that the modified problem is stable and its solution is an approximation of the exact solution of the original problem. Finally, some other convergence results including some explicit convergence rates are also provided.

Outward Blended and Inward Curves

Mohammad Javed Khilji

Under this study a variety of closed curves, complying the property of their radius of curvature being continuously differentiable are formed to find

their genesis in multifoci closed curves. A program is developed in C language for the tracing of such geometric curves. These curves are classified into three categories such as outward, blended and inward curves. An outward curve is defined as a set of points in the plane such that the sum of the positive distances to non-collinear focal points is a constant. A blended curves is defined as a set of points in the plane such that the sum of the positive and negative distances to non-collinear focal points is a constant. In blended curves some of the focal points with positive distances remain inside while some with negative distances remain outside the traced curve. Inward curves are obtained through only the sum of the negative distances of the moving point from the focal points which always keep the traced curve inside them. The rare properties and unfathomable geometrical profile make these curves an excellent gizmo to utilize in diverse fields for commercial and noncommercial purposes such as nuclear science, space science and biosciences where the biological growth pattern in animals and plants can be studied. It adds new dimensions to analytical geometry, topology and other subjects related to mathematics beyond the prevailing concept of discovered curves. These curves will be a subject by itself and will open up new vistas of knowledge for the researchers.

An Inverse Problem for a Pseudoparabolic Equation

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In this work we study an inverse problem for a pseudoparabolic equation with an integral overdetermination condition. By the successive approximation method we prove the existence and uniqueness of a weak solution to this problem.

The Effects of Human Population Movements to Malaria Spread in Kenya

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Malaria is an infectious disease caused by parasites that can be transmitted by mosquitoes. Malaria remains one of the major killers of humans worldwide, threatening the lives of more than one third of the world's population. In particular, Kenya in Africa is one of the malaria endemic countries. In fact, 25 million out of a population of 34 million Kenyans are at risk of malaria. Thus, reducing malaria morbidity and fatality rate is one of the country's major public health targets. Due to rapid urbanization in Kenya, informal urban settlements are expanded, and environmental degradation is accelerated, which leads to increase of malaria. Moreover, such urbanization has been causing a large volume of human population movements from place to place for work, education, or farming. This factor also contributes to the rapid malaria distribution in the whole country. Thus, we investigate types of human population movements in Kenya and their effects on the malaria spread to establish a strategy of prevention of malaria in Kenya.

Detection of Website Structural Changes

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The Website monitoring represents an important activity within the framework of the business intelligence and the economic intelligence. It is a real-time detection of the Website changes. There are several types of changes: form changes, content changes, structural changes or metadata changes.

In this paper, we compare two methods of the structural changes detection. These methods are based on structural modeling of websites. These two methods are the FINGERPRINT method and Document Tree Based method. We also provide experimental validation of both methods and some changes to overcome their limitations.

Classical Character of 2-OP Families via Generating Function with an Application

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In this paper we study the classical character of 2-OPS whose generating function satisfies a first order differential equation. Our results give some information about the classical character of the 2-Sheffer-Meixner type polynomials. A further application deals with the so-called 2-generalized birth and death processes.

Applications of Partial Differential Equations in Flow Conditioners Technology Field

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This paper presents an application of nonlinear partial differential equations for a numerical experimentation of the behaviour of a flow in a duct. These equations are respectively named continuity and momentum equations. The equations describe a turbulent flow in duct subject to disturbers with the presence of flow conditioners. The solution of the equation set is obtained by using the finite volume method. For the finale solution the $k-$ partial differential equations are used to close the equations set.

In this paper the results show the effectiveness of the application of partial differential equations to describe the flow behaviour in a duct with initial and boundary conditions. The numerical results are compared to experimental results and they agree quite well.

This study is a part of a research project approved by the Algerian Ministry of Higher Education and Scientific Research under number J0303920130026.

An Accurate High-Frequency Full Wave Mathematical Model for Nanometric Silicon PIN

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This paper presents a high-frequency full wave model for Silicon PIN diode. Indeed, we present three-dimensional solutions for the Maxwell's equations considering finite-difference time domain (FTDT) method. Electromagnetic field equations are taken into account using perfectly conducting surfaces boundary conditions. These permit to model the stripline effect according to the absorbing boundary conditions.

This model consists of two coupled ones: the active device model (DDM: Drift Diffusion Model) and the full wave model. The coupling between the two models is established by considering the electric and magnetic fields obtained from the solution of Maxwell's active device equations. To update these fields, the current densities are then computed.

Numerical results are generated to investigate the effects of electron-wave interaction on the behavior of the nanometric photodiode PIN.

We observed that the sensitivity of the photodiode decreases versus the frequency of the considered electromagnetic wave.

Key words: FTDT, Silicon PIN, Electromagnetic, boundary conditions, current densities, sensitivity.

Integration of Fuzzy Sets and Multi-Criteria Decision Making: Implications to Computational Procedures

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The fuzzy sets theory has been developed tremendously since 1965 from a typical notation of single membership of fuzzy sets to the recent footprint of

uncertainty of type-2 fuzzy sets. It has been successfully integrated in many multi-criteria decision making (MCDM) methods. It seems that almost all versions of fuzzy sets-based definitions are fitted well with decision making methods thereby innovating many novel methods of fuzzy multi-criteria decision making. However, the effect of these integrations toward computational procedures of MCDM is rarely investigated. This paper reviews examples of the integrations and investigates its implication to the computational procedures of MCDM. A numerical example is presented to illustrate the implications.

On the Problem of Controlling Diffusion Processes until a Random Final Time

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Let $X(t)$ be a one-dimensional controlled diffusion process. We want $X(t)$ to leave the interval (a, b) as soon as possible, while taking the quadratic control costs into account. In this talk, we will fix the form of the control and compute the corresponding expected cost. When possible, this expected cost will be compared to the minimal cost obtained when the exact optimal control can be determined by using dynamic programming.

A Fourth Order One-Step Block Method for Solving a Stiff Ordinary Differential Equation

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In this paper, we propose an A-stable one-step block method of order four for solving a stiff ordinary differential equation. This method will approximate the solutions of a stiff ordinary differential equation at three points simultaneously a using constant step size. The method is similar to the one-step method and it is self-starting but the implementation is based on the

predictor and corrector formulae. Several problems have been tested in this paper to prove the efficiency and accuracy of this method. Numerical results are presented to illustrate the performance of the proposed method. The results clearly show that the proposed method is able to produce comparable and better results compared to the existing method when solving stiff differential equations.

Cosmological Model with Dark Energy in Scale Invariant Theory

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We have constructed a cosmological model of the universe in scale invariant theory with dark energy. The space-time is in the form of a diagonal Bianchi type V metric and the matter field is considered to be the perfect fluid. Pressure anisotropy is considered along different spatial directions. From the constructed cosmological models, we found a dynamic pressure anisotropy which continues along with the cosmic expansion. At a late phase of cosmic evolution, the model enters into a phantom region.

Existence of a Fixed Point for a Model Predator-Prey

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Last year I attended the third conference in Abu Dhabi, 'I presented a construction and mathematical study of a predator-prey modl. This year I will introduce fixed point existence of the same model.

Justification of the Wavelet Galerkin Method for Solving a Problem of Filtration Theory

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The work is dedicated to the justification of the wavelet Galerkin method for solving problems of the filtration theory with free boundaries. The possibility of using the wavelet Galerkin method is presented. Numerical calculations for solving the problem of filtration theory with free boundaries are carried out.

The Main Ways of Improving Educational Staff to Use ICT

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This article describes innovative methods and effective ways to improve the training of teachers on ICT. Further steps for training of teachers, involving international companies by UNESCO, Microsoft and Intel, are recommended.

N-symmetry of Itô Stochastic Differential Equation Driven by a Poisson Process

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Lie point symmetry transformation of the class of Itô stochastic differential equation driven by Poisson processes was successfully carried out. We consider symmetries involving not only spatial and time variables (t, x), but also the Poisson process term $N(t)$. The result was achieved by following the invariance methodology of Lie point transformation and the used of Itô formula for Poisson stochastic differential equation without enforcing any conditions to the momenta of the stochastic process.

The Combination of Principal Component Analysis and Geostatistics as a Technique in Assessment of Groundwater Hydrochemistry in Arid Environment: A Case Study of Central Saudi Arabia

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Central Saudi Arabia is one of the most arid regions of the world with very little precipitation and extreme climatic conditions. In the absence of available surface water supplies, the non-renewable groundwater resources stored in the Mesozoic sedimentary formations form the most important source for irrigation and domestic water requirements. Therefore, groundwater quality monitoring by different techniques and tools is a very important and vital

issue. The present study deals with 103 groundwater samples collected from Saq aquifer which is considered as the major aquifer in the region. The study employed Principal Component Analysis (PCA) and Geostatistical analysis for groundwater quality mapping.

Using PCA, the study intended to establish a series of factorial variables that summarize all the hydro-chemical information. Efforts have been made to identify the spatial development of the principle process acting on GW quality by mapping GW quality using factorial variables and ordinary kriging (OK) techniques. PCA helps to understand two important new variables showing that chemical characteristic acquired through rock water interaction and anthropogenic influences. By applying Kriging interpolation technique, the spatial variability of these variables over the extent of the MMA is mapped. The study results concluded that both natural and anthropogenic processes contribute to the groundwater quality, but anthropogenic impacts can be considered as the most important and influential ones.

Key words: principal component analysis, geostatistics, arid region, groundwater quality, Kriging, Central Saudi Arabia.

Regularized Legendre-Collocation Method Applied to First Kind Fredholm Integral Equation

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In this talk, a numerical approach based on the Legendre-Collocation Method is proposed to approximate the solution of Fredholm integral equations of the first kind. We also establish some error estimates under a suitable assumptions on the exact solution. Finally, some numerical examples will be stated to show the accuracy of this method.

Many problems in applied mathematics and engineering can be formulated as Fredholm integral equations of the first kind. The determination of the solution of these equations is an ill-posed problem in the sense of Hadamard; in the sense that the solution (if it exists) does not depend continuously on the data.

In this work, we suggest a numerical procedure based on the Legendre-Collocation projection method, where the solution is projected onto a subspace generated by Legendre polynomials.

A Structural Approach for the Social Networks

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WEB 2.0, with its newest form of interactivity, has made the user a collaborative actor in the process of production and diffusion of information. Thereby, they could gather up through particular exchange platforms known as "social networks" which, since their emergence in the late 90's, have experienced a very wide use. As a consequence, a huge mass of information has been generated leading researchers from all disciplines to carry out advanced studies in order to analyze this information by determining properties of social networks.

We shall present, through this paper, one of the most used approaches namely the graph-theory-based mathematical approach which has allowed a better visualization and qualification of the structural properties of these networks.

Application of Variational Iteration Method to the Solution of Convection-Diffusion Equation

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In this paper, an algorithm is constructed based on the Variational Iteration Method (VIM) to solve Convection-Diffusion equation. The algorithm converges faster and has proved elegant. Numerical examples are presented to show the efficiency of the method.

On the Convergence of Sequences of Interval Numbers

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In this paper, defining the concept of rough convergence of a sequence of interval numbers, we prove the convexity of the rough limit set of a sequence. Then we obtain some basic results related to the rough limit set of a sequence of intervals.

Differential Property of the Jacobian

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The article considers a differential property of the Jacobian of multivariate polynomial maps. As a matter of fact, the Jacobian of 2 polynomials with 2 variables in the space of polynomials sets a Lie algebra. Naturally the question arises: "What would happen if the number of variables is more than 2?" It turns out that in case of multivariate polynomials including the case $n = 2$ the Jacobian sets a module structure over a Lie algebra. The set obtained by multivariate polynomials differentiation forms a Lie algebra which is called a Cartan type general Lie algebra. According to the De Rham cohomology theory those differetiation operations have a divergence. The differentiation set that has no divergence forms a subalgebra of the Lie algebra. This Lie subalgebra is called a Cartan type special Lie algebra. And so, the Jacobian, in a sense, commutes with no divergence differentiation.

Keywords: Jacobian, differentiations, Lie algebra, module.

Coupled Differential Equations for Laser Diode Simulation

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The laser dynamics can be modeled by coupled rate equations which describe the relation between the carrier number $N_p(t)$, the photon density $S_p(t)$ and the optical phase $\varphi(t)$:

$$\begin{aligned}
\frac{dN_p(t)}{dt} &= \frac{I(t)}{q} - \frac{N_p(t)}{\tau_n} - g(N,T)\frac{N_p(t)-N_0}{1+\varepsilon S_p(t)}S_p(t), \\
\frac{dS_p(t)}{dt} &= \Gamma g(N,T)\frac{N_p(t)-N_0}{1+\varepsilon S_p(t)}S_p(t) - \frac{S_p(t)}{\tau_p} + \Gamma\frac{\beta N_p(t)}{\tau_n}, \\
\frac{d\varphi(t)}{dt} &= \frac{\alpha_o}{2}g(N,T)[N_p(t)-N_0].
\end{aligned}$$

N_0 is the carrier number at transparency, τ_p is the photon lifetime, τ_n is the carrier lifetime, Γ is the optical confinement factor describing the confinement mode in the active region, β is the spontaneous emission factor, ε is the gain compression factor, $g(N,T)$ is the optical gain coefficient dependent on the carrier density and the temperature function, $I(t)$ is the injected current, α_o is the linewidth enhancement factor and q is the electron charge.

The output of the solver is the time, injection current, and the transformed components of the state vector, computed at discrete time steps. The rate equations are integrated using the fourth order Runge-Kutta computation.

A desired modulated laser signal can be generated by direct injection of the laser diode by an electric signal $I(t)$ of suitable format. The carrier number $N_p(t)$, the photon density or optical signal $S_p(t)$ will carry the same information as the modulating electric signal $I(t)$ does. Therefore, in the absence of current modulation, the laser diode emits a constant-power monochromatic light. The current modulation induces a variation of the power and frequency of the beam.

Homogenization of a Class of Elliptic Problems with Nonlinear Boundary Conditions in Domains with Small Holes

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We are interested in the asymptotic behavior of the solutions of a class of second order elliptic problems in a domain of $\mathbb{R}^N$, $N > 2$, periodically perforated by small holes. A nonlinear Robin-type condition is prescribed on the boundary of some holes while on the boundary of the others as well as on the external boundary of the domain, a Dirichlet condition is imposed.

Determination of Optimum Cutting Conditions and Prediction of Tool Wear in Machining Using Taguchi Approach

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In any of the machining operations, the primary aim is to obtain maximum Metal/Material Removal Rate (MRR) without compromising with the quality of the job and tool. In the present study, an attempt is made to increase the efficiency of machining and to reduce the cost of the manufacturing process which ultimately depends on MRR and tool wear. The cutting parameters considered in the present work are operating conditions such as depth of cut, feed rate, and spindle speed. These have been optimized in turning operations of mild steel and brass, as a result of that the combination of the optimal levels of the factors was obtained to get the highest MRR. Design of experiments as suggested by Taguchi has been used to study the

effect on MRR under various levels of these parameters considered. Analysis of Variance (ANOVA) and Signal-to-Noise (SN) ratio were found using MINITAB. A predictive model for the prediction of tool flank wear and an optimization model for the determination of optimum cutting conditions in machining steel and brass are developed. Using the Taguchi method, the optimum cutting conditions are determined so as to obtain maximum MRR. An orthogonal array is used for experimentation. The influence of cutting parameters on the tool life was studied experimentally by performing 27 cutting tests. The optimization model has also been proved to be a convenient and efficient method for finding the optimum cutting conditions associated with the Maximum Metal Removal Rate (MMRR) under different constraints.

Sequential Covering Algorithm for Nondifferentiable Global Optimization Problem and Applications

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In this paper, the one-dimensional unconstrained global optimization problem of continuous functions satisfying a Hölder condition is considered. We extend the algorithm of sequential covering SCA for Lipschitz functions to a large class of Hölder functions. The convergence of the method is studied and the algorithm can be applied to systems of nonlinear equations. Finaly, some numerical examples are presented and illustrate the efficiency of the present approach.

Stability Analysis of Fractional-Order Cohen-Grossberg Neural Networks with Distributed Delays

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In this work, we consider a class of fractional-order Cohen-Grossberg neural networks with distributed delays. Based on fractional calculus, using some inequality techniques, differential mean value theorem and contraction mapping principle, a series of new and useful criteria on the existence of an equilibrium point and their stability analysis of such networks are derived. Some numerical simulations are presented to demonstrate the effectiveness of the derived results.

Numerical Analysis of Turbulent Heat Transfer in Annular Region with Continuous Longitudinal Rectangular Fin

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A turbulent flow in an annular region with a continuous longitudinal rectangular fin has been numerically investigated. The conservation equation of mass, momentum and energy has been solved along with two equation based $k-\varepsilon$ model. The resulting equations have been solved numerically using finite volume technique in unstructured hexahedral cells. This computational result is validated with existing experimental result. The fluids were, air flowing in the annular section, and water through the inner tube. Initially 20 numbers of fins were taken and then an optimization of fin is carried out. The double pipe heat exchanger and fins were made of brass. Due to the high thermal conductivity of the brass and the small temperature variation, the

surface of the inner tube was practically isothermal. The external tube was well insulated and can be considered adiabatic. The results are presented in dimensionless forms, in terms of the average Nusselt number, friction factor and fin efficiency, as functions of the flow Reynolds number. A comparison of the present results with those for smooth sections (without fins) is also presented.

Estimation of Parameters and Reliability Function of Lindley Distribution for Progressive Type II Censored Data with Binomial Random Removals-Scheme

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In this paper, we propose maximum likelihood and Bayes estimators of parameters and reliability function under general entropy loss function and squared error loss function for progressive type II censored data with binomial removals. The maximum likelihood estimators and corresponding Bayes estimators are compared in terms of their risks based on simulated samples from Lindley distribution.

Keywords: maximum likelihood estimators, Lindley distribution, Bayes estimators, entropy loss function, progressive type II censored data.

Optimal Control Approach for a Delay Differential Model of Tumor-Immune System with Immunotherapy and Chemotherapy

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In this paper, a delay differential model with optimal control is presented to describe the dynamics of tumor-immune interactions in the presence of immuno-chemotherapy treatments. The role of interleukin-2 (IL-2) in stimulation of the effector cells and tumor dynamics is considered in the model with a discrete time-delay to justify the time required to stimulate the effector cells. An expression for the length of the time-delay to preserve stability is deduced. Two optimal control variables are incorporated to identify the best treatment strategy with minimum side effects by blocking the production of new tumor cells and keeping the level of normal cells above the average of its carrying capacity. Pontryagin's maximum principle is applicable to characterize the optimal controls. An algorithm to approximate the solution of the optimal control problem is suggested by solving the state system (forward) and adjoint system (backward) in time. The numerical simulations show that combination therapy protocol of immuno-chemotherapy reduces the tumor cells load in few months of therapy.

Integrability and Limit Cycle Bifurcations in Polynomial Systems of ODEs

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In the talk we discuss the problems of existence of analytic first integrals, center manifolds, periodic solutions and the problem of stability, and their interconnection. We also explicitly compute center manifolds and first integrals for several families of systems with quadratic and cubic higher-order

terms and describe computational methods for the study, in particular, an approach for solving systems of polynomials using modular calculations.

Numerical Results in Fluid Mechanics

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The need for the full Navier-Stokes simulation for complex fluid flows arises in numerous engineering problems, such as hydrodynamic and aerodynamic where the flows around obstacles have a fundamental importance. In this paper, we present a mathematical study and numerical results for a two-dimensional viscous flow problem with obstacles in an unsteady regime. The numerical method used is based on a Chorin type projection method of first order in time and second order in space, on a staggered grid. A numerical study of the Navier-Stokes equations is implemented for the treatment of incompressibility and solid constraints for a horizontal fluid flow. Results for this study are presented in order to show the efficiency of this method and then combined with an analytical method to handle the obstacles incorporated in the fluid for simple and complex horizontal flows. At last, some numerical results which treat the same problem using a finite element scheme will be presented.

Minimisation of the Condition Number of the Elastic Neumann Problem Using the Modified Fundamental Solution

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In our works [2] and [3], an optimal choice of the multipole coefficients is determined for two-dimensional elastic waves. These complex factors are

involved in the modification of the fundamental solution, which plays the role of the kernel of the modified integral operator in elasticity.

In this note, it is intended to determine another optimal choice for the multipole coefficients by minimising the condition number of the integral equation in two-dimensional elastic waves. This optimal criterion is related to the numerical stability of the integral equation.

Keywords: multipole coefficients, Green's function, integral equations, elastic waves.

Mathematics Subject Classification: 65N38.

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An Iterative Algorithm to Solve an Inverse Problem Related to the Heat Equation in Two Dimensions

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In this work, we will study an inverse problem related to a problem that models the propagation of heat in metallic plate. Our study area is inside

the metallic plate whose lower part is embedded, therefore inaccessible. We will perform measurements on the upper part of the plate, which is not in contact with the ground. For this, we will take measurements. This problem is modeled by a heat equation with presence of an unknown term in the boundary conditions; this term is an unknown function which can take several forms. It is by this function that we will detect the presence or absence of damage inside the bar caused by the heat in the case when the plate is deformable. We will then follow our steps to the top edge of the field information on the evolution of this damage. We will first formulate our problem which is an inverse problem and we will make a theoretical study. We will show that this problem has a unique solution. Afterwards, we will solve this problem by constructing an iterative algorithm which gives a series of cross problems which give a sequence of approximate boundary values on the inaccessible part of the border of the plate. Finally we study the convergence and make a numerical application.

Solvability of a Problem for Stationary Equations of Magnetic Hydrodynamics

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The work is devoted to the solvability of a problem of magnetic hydrodynamics. The medium considered consists of a conducting medium viscous incompressible fluid in a bounded domain. The vector field of velocities and pressure, as well as electromagnetic field environment.

Group Algebras Whose Groups of Normalized Units Have Exponent 4

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It is well known that there does not exist a reasonable description of finite groups of prime square exponent p^2 (not even in the case when the exponent is 4). However Z. Janko (see for example [3, 4, 5]) was able to characterize these groups under certain additional restrictions on their structure. In this way he obtained interesting classes of finite p-groups.

In our talk we give a full description of locally finite 2-groups G such that the normalized group of units $V(FG)$ of the group algebra FG over a field F of characteristic 2 has exponent 4 (see [1], [2]).

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Results on Resolvability and Metric Dimension in Graphs and Some Applications

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For an ordered set $W = \{w_1, w_2, \ldots, w_k\}$ of vertices and a vertex v in a connected graph G, the (metric) representation of v with respect to W is the k-vector $r(v) = (d(v, w_1), d(v, w_2), \ldots, d(v, w_k))$, where $d(x, y)$ represents the distance between the vertices x and y. A resolving set of minimum cardinality is called a minimum resolving set or a basis and the cardinality of a basis for G is its dimension $\dim(G)$. A basis W of G is said to be connected if the subgraph induced by W is connected. In this paper, we discuss about the properties of graphs which do possess a connected basis. It is established that $K(m, n)$ admits a connected basis if and only if $m > 1,\ n > 1$. If $v_i,\ v_j$ are any two vertices in a cycle $C(n)$ $(n \geq 3)$, then it is established that (1) The set $\{v_i, v_j\}$ forms a basis if and only if $d(v_i, v_j) \neq \frac{n}{2}$. (2) The set $\{v_i, v_j\}$ forms a connected basis if and only if $d(v_i, v_j) = 1$. Also it is proved that for a k-regular graph G, where $\dim(G) = k$ if and only if $k \in \{1, 2\}$. It is discussed about the metric dimension of some graphs and their line graphs. The metric dimension of the square graph of the families $P(n),\ C(n)$ and the Petersen graph is determined. It is established that for a graph G with n vertices, if $d(u, v) \leq 2$ for all $u, v \in V(G)$, then $\dim(G^2) = n/2$. Finally, we tried to find some applications of resolvability and metric dimension in some fields.

Coefficient Inequality for a Subclass of Starlike Functions Using n-th Derivative

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A newly constructed class of analytic functions and its subclasses will be discussed here, by which coefficient bounds of $|a_3 - \mu a_2^2|$ for the analytic

function

$$f(z) = z + \sum_{n=2}^{\infty} a_n z^n, \quad |z| < 1,$$

belonging to these classes and subclasses, will be obtained.

Exact Inference in Bayesian Networks

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Bayesian networks are graphic probabilistic models through which we can acquire, capitalize on, and exploit knowledge. Over the past 10 years, research pertaining to Bayesian networks has increased significantly in the public and private sectors alike. They are used to represent knowledge from a system (marketing, health, technical, industry, economic, education, etc.) or to find this knowledge by analyzing data, i.e. through the learning process.

Inference is used to acquire knowledge from Bayesian networks, it is considered as one of the most important and difficult tasks in the learning process. A lot of algorithms were proposed in the last decade for exact and approximate inference in Bayesian networks.

In my talk, I will introduce Bayesian networks and the inference problem. I will summarize the algorithms that were developed for the exact inference in Bayesian network and give details to two of them, Lauritzen-Spiegelhalter and Successive Restrictions Algorithms. I will use an example to compare both algorithms in terms of the perspective of intermediate graphical structures and computational efficiency.

Oscillations of Delay and Difference Equations with Several Deviating Arguments

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Consider the first-order delay differential equation

$$x'(t) + \sum_{i=1}^{m} p_i(t)x(\tau_i(t)) = 0, \quad t \geq 0,$$

where, for every $i \in \{1, \ldots, m\}$, p_i is a continuous real-valued function in the interval $[0, \infty)$, and τ_i is a continuous real-valued function on $[0, \infty)$ such that

$$\tau_i(t) \leq t, \quad t \geq 0, \quad \text{and} \quad \lim_{t\to\infty} \tau_i(t) = \infty,$$

and the discrete analogue difference equation

$$\Delta x(n) + \sum_{i=1}^{m} p_i(n)x(\tau_i(n)) = 0, \quad n \in \mathbb{N}_0,$$

where $\mathbb{N} \ni m \geq 2$, p_i, $1 \leq i \leq m$, are real sequences and $\{t_i(n)\}_{n\in\mathbb{N}_0}$, $1 \leq i \leq m$, are sequences of integers such that

$$\tau_i(n) \leq n - 1, \quad n \in \mathbb{N}_0, \quad \text{and} \lim_{n\to\infty} \tau_i(n) = \infty, \quad 1 \leq i \leq m.$$

Several optimal oscillation conditions for the above equations are presented.

Foreign Direct Investment of India and China: An Evaluation of Performance through Time Series Analysis

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India and China are preferred destinations for foreign investors, in spite of their diverse cultural factors and different economic-political systems. The phenomenal growth in foreign direct investment (FDI) of both economies can be traced back to the active government promotion through various policy measures. There is no denying the fact that FDI in China and India has played a largely positive role in their economic development. In order to verify it, a detailed analysis is done with the help of methodology used by Agosin and Mayor (2000) by making use of time series data of thirty years for both countries. The World Bank data expressed in constant prices in US$ at 2005 year base is put to use. Three variables such as FDI, gross domestic product (GDP) and gross capital formation rate (GCFR) are considered for time series analysis. The results are verified with the help of techniques namely; Granger-Causality, Cointegration test, Unit root test. The result obtained brings to us startling revelations about FDI. It indicates that emergency measures will have to be taken by both countries, especially China, to ward off the adverse consequences.

Keywords: foreign direct investment, India, China, domestic investment.

Numerical Studies for the Multi-Strain Tuberculosis Model

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In this talk, numerical studies for the multi-strain tuberculosis (TB) model, that incorporates three strains, i.e., drug-sensitive, emerging multi-drug resistant (MDR) and extensively drug-resistant (XDR), which developed by J. Arino and I. Soliman (2014), are introduced. The adopted model is described by a system of nonlinear ordinary differential equations (ODEs). A special class of numerical methods, known as nonstandard finite difference method (NSFDM) is introduced. The obtained results of using NSFDM are compared with other known numerical methods such as implicit Euler method and fourth-order Runge-Kutta (RK4) method. Also, the fractional-order multi-strain TB model (FOTBM) as a novel model is presented. The fractional derivative is defined in the sense of Grnwald-Letinkov definition.

Two numerical methods are presented to study this model, the standard finite difference method (SFDM) and NSFDM. The stability of equilibrium points is studied. As an extension of FOTBM, the variable-order fractional multi-strain TB model (VOFTBM) is presented. The variable-order fractional derivative is defined in this sense of Grünwald-Letnikov definition. Two numerical methods are presented for this model, SFDM and NSFDM. The stability of equilibrium points is studied. Finally, the optimal control for multi-strain TB model is presented. TB control problem is formulated and studied theoretically using the Pontryagin maximum principle. Different optimal control strategies are proposed to minimize the cost of interventions.

Nonhomogenous Fourth Order Elliptic Equations on Compact Manifold

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Using a method developed in [9] and by Mountain-Pass Theorem, Ekeland lemma and under some geometric conditions, we prove the existence of at least two distinct weak solutions.

An Encryption Algorithm Based on a Suitable Use of the Chaotic Standard Map

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In the recent years, a number of image encryption algorithms based on the permutation-diffusion structure have been proposed. The typical structure of these algorithms has the permutation and the diffusion stages performed alternatively. The confusion and diffusion effect is solely contributed by the permutation and the diffusion stage, respectively. As a result, more overall rounds than necessary are required to achieve a certain level of security. In

this paper, we suggest to introduce certain diffusion effect in the confusion stage by simple sequential add-and-shift operations. The purpose is to reduce the worload of the a time-consuming diffusion part so that fewer overall rounds and hence a shorter encryption time are needed. Simulation results show that at a similar performance level, the proposed cryptosystem needs less than one-third of the encryption time of an existing cryptosystem. The effective acceleration of the encryption speed is thus achieved.

Chi-Squared Test for Generalized Rayleigh Distribution

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The generalized Rayleigh distribution introduced by Surles and Padgett (2001), is used in modelling strength and general lifetime data. In this work, we propose the construction of a modified chi-square test for this distribution. We use the Nikulin-Rao-Robson (NRR) statistic, which is based on maximum likelihood estimators on initial data. Simulation study and numerical examples are given to illustrate the practicability of the test proposed.

About the Structure of Matrizer Systems of Ordinary Equations of First Order and Its Applications

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The theory and methods of systems of ordinary differential equations of first order with variable coefficients have a wide range of applications in physics, mechanics, engineering, mathematical methods of economy, etc. This paper presents results on the creation of the structure of the normalized

matrix of the fundamental solutions for some class of matrices of coefficients of B. Researches have shown that this class contains equations of the movement of elastic anisotropic media, the Maxwell's equations describing wave processes in anisotropic dielectric media, distribution of the thermoelastic flexural, piezoelectric, piezomagnetic waves in media with magnetoelectric effect, etc.

Nonlinear Carleman-Vekua Equation with a Singular Point

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In this paper unconditional solvability of the nonlinear Carleman-Vekua equation with a singular point is proved, the Riemann-Hilbert problem is solved and the structures of the zeros and poles of the solutions are investigated.

Double Integral Characterization of Besov-Type Spaces

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Let $\mathbb{D}$ be the open unit disc in the complex plane$\mathbb{C}$. We denote by $H(\mathbb{D})$ the class of all analytic functions on $\mathbb{D}$. Fix $1 < p < \infty$ and $-1 < r < \infty$. The Besov space $B_{p,r}$ is the space of all $f \in H(\mathbb{D})$ such that

$$\|f\|_{B_{p,r}} = \left(\int_{\mathbb{D}} |f'(z)|^p (1 - |z|^2)^r \, dA(z) \right)^{1/p} < \infty,$$

where $dA(z)$ denotes the Lebesgue area measure on $\mathbb{D}$.

In this article, we give a double integral characterization of Besov-type spaces.

On Some Generalized Inequalities for Reproducing Kernel Hilbert Space Operators

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In this paper, we give some Hardy-Hilbert type inequalities for reproducing kernel Hilbert space (RKHS). Also, we generalize several inequalities involving powers of the Berezin number acting on RKHS.

Pullback Attractors for a Class of Semilinear Nonclassical Diffusion Equation with Delay

Mustapha Yebdri
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The nonclassical diffusion equations occur as models in mechanics, soil mechanics and heat conduction theory. In the recent years, the existence of pullback attractors has been proved for some nonclassical diffusion equations. Recently, there are many people who concentrate on functional partial differential equations. C. The Anh and T. Quoc Bao, and F. Zhanga and Y. Liu proved the existence of a pullback attractor for a partial differential equation without delay. In this Talk, we prove the existence of a pullback D-attractor for the following functional partial differential equation

$$\begin{cases} \frac{\partial}{\partial t}u(t,x) - \Delta\frac{\partial}{\partial t}u(t,x) - \Delta u(t,x) + f(u(t,x)) = b(t,u_t)(x) + g(t,x) \\ \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \text{in} \quad (\tau,\infty)\times\Omega, \\ u = 0 \quad \text{on} \quad (\tau,\infty)\times\partial\Omega, \\ u(\tau,x) = u^0(x), \qquad \tau\in\mathbb{R} \quad \text{and} \quad x\in\Omega, \\ u(\tau+\theta,x) = \varphi(\theta,x), \qquad \theta\in[-r,0] \quad \text{and} \quad x\in\Omega, \end{cases}$$

where $\Omega\subset\mathbb{R}^N \quad (N\geq 3)$ is a bounded domain with a smooth boundary $\partial\Omega$.

Bézier Geodesic-Like Curves on 2-Dimensional de Sitter Space

Ahmet Yücesan
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We obtain the system of geodesic-like equations on 2-dimensional de Sitter space. Then, we compute the Bézier geodesic-like curves on 2-dimensional de Sitter space using the system of equations.

Halanay-Type Stability Theorems for Linear Systems on Time Scales with Unbounded Delay

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The stability of the zero solution of a system of first-order linear functional differential equations with nonconstant delay on an arbitrary time scale is considered. Sufficient conditions of Halanay type are established for the zero solution to be stable, uniformly stable, asymptotically stable, and uniformly asymptotically stable. In case of a constant delay, we obtain uniform asymptotic stability when the conditions on stability are satisfied. The general case, however, is still open.

European Call Barrier Option with Fixed Maturity

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This paper aims to study and analyse the pricing PDEs for barrier options as well as European barrier options in the Black-Scholes framework with deterministic maturity. When the maturity is deterministic, we provide an explicit expression for European call and put using the distribution of the maximum of a Brownian motion.

Spline Approximation of Functions in the Generalized Hölder Spaces

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A theorem of approximation of functions defined on arbitrary smooth contours of the complex plane by means of interpolation splines in generalized Holder spaces is proved. An estimate of the approximation and a sufficient condition for convergence of the interpolation process are obtained.

Application of the Splitting Method for the Numerical Solution of Non-Stationary Problems of Elastic Medium Dynamics

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Nowadays the need for qualitative and quantitative analysis of the dynamic effects of the stress-strained state increases since it is widely used in various fields of engineering, structural elements, etc., working in the dynamic load duty. As a result of the dynamic loads in the test body there appear elastic waves. And a reliable calculation of it helps to evaluate the strength and reliability of the entire design and technology.

Currently, for solving dynamic problems in elastic media used numerical methods of spatial characteristics, finite elements, the boundary integral equations etc. are used. A difference method using the method of spatial characteristics proposed by Clifton for the study of planar dynamical problems, and by Recker developed to study the advance of elastic waves in isotropic bodies rectangular in shape.

In this paper we reviewed the non-stationary problem solution of the homogeneous isotropic elastic body dynamics in the Cartesian coordinate system using the splitting method

Heat and Mass Transfer on Isothermal Inclined Porous Plate in the Presence of Chemical Reaction

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Analytical solution of steady laminar flow of viscous electrically conducting incompressible fluid, over a semi-infinite inclined plate, which is at prescribed mass flux, in a porous medium with heat generation and chemical reaction is presented in the manuscript. The effects of various parameters like Schmidt number, Chemical reaction, Thermal Grashof number, Solutal Grashof number, angle of inclination etc. on the velocity, temperature and concentration are presented graphically. The results obtained, show that these parameters influenced substantially. Heat transfer, mass transfer, heat generation, concentration, inclined wall, chemical reaction

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