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Dear Respected Academics and Researchers,

Online Presentations:

On behalf of the Organizing Committee, we are pleased to announce that the First Academia International Conference on Mathematics and Mathematics Education (AICMME-2021) will be held in Siirt University from 25-27 November 2021. Due to the COVID-19 pandemic, presentations will be held online. This conference focuses on the theory and the applications of all mathematical sciences. All researches related to Pure Mathematics/Mathematics Education are in the scope of the conference topics. AICMME -2021 provides an ideal academic platform for researchers and professionals to discuss current and universal issues in both mathematics and mathematics education sciences and share their experiences. You can find more information about this event on the AICMME -2021 website:
All articles undergo rigorous peer-review by at least two scientific committee members or additional reviewers. While conference languages are in English and Turkish, short abstracts and proceedings should be prepared in English.
All registered participants will be given a certificate of participation and sent by e-mail.
We look forward to seeing you in Siirt/ Turkey.
With our best regards,

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On the search and study of analytical solutions of Generalized Differential Equations

Juan E. Napoles Valdes[1,2]

[1] Universidad Nacional del Nordeste FaCENA, Corrientes Capital, 3400, Argentina

[2] Universidad Tecnologica Nacional FRRE, Resistencia, Chaco 3500, Argentina

Abstract

In this paper, we present some results related to obtaining and studying the solutions of generalized differential equations, by means of a certain generalized integral transformation. The results obtained in the first part of the work are illustrated with two general cases: a generalized differential equation, which contains as a particular case a non-conformal differential equation previously studied by the author, in terms of its oscillatory nature, and a partial differential equation conformable, of Klein Gordon type. Some difficulties and errors in the global fractional case are presented.

AMS Subject Classification (2010): Primary 26A33, Secondary 34K37.

Key words and phrases: Fractional derivatives e integral, generalized derivative, fractional calculus.

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A numerical study of initial flow past a circular cylinder subject to a circular motion

Qaseem Al-Mdallal[1]

[1]Department of Mathematical Sciences, United Arab Emirates Universıty

Abstract

This presentation focusses on a numerical treatment of the initial flow past a circular cylinder with combined streamwise and transverse oscillations. The motion is governed by the two-dimensional unsteady Navier–Stokes equations in non-primitive variables. The method of solution is based on the perturbation theory together with the collocation method. The development of the physical properties of the flow such as time at which the fluid separates, drag and lift coefficients at early times is captured. Comparisons with existing results verify the accuracy of the present results.

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Developing Mathematics Literacy through Dual Focus Teaching

Murat ALTUN[1]

[1]Uludağ University Department of Mathematics Education, Turkey

Abstract

Developing Mathematical Literacy with a Dual-Focus Teaching Model

A) What is Mathematical Literacy? Its Evaluation in terms of Mathematical Literacy in Turkey

B) Dual Focus Teaching Model

Academia International Conference on Mathematics and Mathematics Education, 1-3 December 2021, Siirt, TURKEY

New Horizons in Digital Mathematics Teaching

Aslan GÜLCÜ[1]

[1]Atatürk University Department of Mathematics Education, Turkey

Abstract

Digital Immigrants are creating new neighborhoods, villages, cities and perhaps new countries. Virtual migration, which started especially after the 2000s, continues to affect social life deeply. New generations, such as the Z generation, where immigrants are raised, are born and grow up in virtual worlds. With these characteristics, each generation becomes a person of a different world. Every new generation has the opportunity to learn, perceive, transfer, live, etc. human characteristics also vary according to the characteristics of the generation. As such, the 'features' of the previous generation cease to be the 'features' of the next generation and become archaic.

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On the fractal dynamics for higher order traveling waves

Emile F. Doungmo Goufo[1]

[1]Department of Mathematical Sciences, University of South Africa, Florida, 0003, South Africa.

Abstract

Auto replication processes remain fascinating in sciences, engineering and technology as their applications in machining/biological systems have been widely used to solve number of outstanding problems in communities' every day lives. Finding innovative techniques capable of generating auto replication processes in various fields has then become the priority for number of scientists. One of those fields includes wave motion. In this paper, we use the 7th order Korteweg-de Vries (KdV) model, combined with the fractal-fractional operator to artificially (numerically) generate auto replication processes characterizing the evolution of higher order traveling waves. The well-posedness for the combined model is first studied with the establishment of its existence and uniqueness results. We also explore other dynamics related to notions such as the Dubai highway and the trinition. Numerical simulations then follow and prove that the higher order traveling wave together with other dynamics can be involved in a self replication process.

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A numerical approach for solving distributed-order fractional Volterra-Fredholm Integro-Differential Equations

H. Jafari[1,2,*] , R.M. Ganji[1] , M.N. Ncube[2]

[1]Department of Mathematical Sciences, University of South Africa, UNISA 0003, South Africa

[2] Department of Mathematics, University of Mazandaran, Babolsar, Iran

[*]Presenter: jafari.usern@gmail.com

Abstract

In this work, a numerical method is presented to obtain approximate solution of distributed-order integro-differential equations. The approximate solution is expressed in the form of a polynomial with unknown coefficients and in place of differential and integral operators, we make use of matrices that we deduce form the shifted Legendre polynomials. To compute the numerical values of the polynomial coefficients, we set up a system of equations that tallies with the number of unknowns, we achieve this goal through the Legendre-Gauss quadrature formula and the collocation technique. The theoretical aspects of the error bound is discussed.

Keywords: Distributed-Order Integro-Differential Equations; Operational Matrix; The Legendre-Gauss Quadrature; Volterra-Fredholm Integro-Differential Equations.

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Monotonicity analysis for fractional difference operators

Thabet Abdeljawad[1]

[1]Department of Mathematics and Sciences, Prince Sultan University, Saudi Arabia

Abstract

Discrete fractional monotonicity analysis discusses the relation between the sign of the fractional difference operators, either in nabla or delta sense, and the monotonicity of the discrete function under investigation. We investigate the monotonicity coefficient of different kernel type discrete fractional difference operators in the power, exponential and Mittag-Leffler laws, and for the proportion discrete fractional case. As an application different versions of the Mean Value Theorem are formulated for such types of discrete fractional calculus. Comparisons are made to understand the structure of such classes of discrete fractional operators.

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A Rubric Study for Evaluation of Mathematics Lesson Plans

İnayet ÖZEL*

ozellinyt@gmail.com

*Siirt University Department of Mathematics Education, Siirt, Turkey

Cahit PESEN

cahit.pesen@gmail.com

*Siirt University Department of Mathematics Education, Siirt, Turkey

Malik DURMAZ*

malikdurmaz@gmail.com

*Siirt University Department of Mathematics Education, Siirt, Turkey

Abstract

Though societies are evaluated based on education to see their level of development, teacher competence is what is taken as a criterion for the quality of education as teacher competence is one of the crucial factors that affects the quality of teaching. Although teacher competencies are defined as a construct consisting of two dimensions: "understanding and enactment" (Park & Oliver, 2008, p.278) and "continuity" (Blömeke et al. 2015, p.8), they can be defined as the set of knowledge, skills, attitudes, and values required for teachers to teach in various situations (MEB, 2017; Weinert, 2001). In order to train teachers with high levels of competence, it is essential to develop and evaluate the competencies possessed by pre-service teachers while receiving pre-service education. One of the competencies that should be developed and evaluated in terms of the level of development is education and training planning (MEB, 2017). Being aware of the gains that are aimed to be gained by the student; mastering the learning-teaching methods, techniques and strategies to be used in gaining the gains; organizing materials to match student characteristics and teaching process; Situations such as student foreknowledge, being aware of the mistakes, difficulties and solution suggestions that can be experienced in teaching are the components of education and training planning competence. Although planning education and training may seem like a discrete teacher competence, it is a competence that co-ordinates many of the teacher competences

identified. Components of the competence to plan education and training include awareness of the acquisitions which are targeted for the student, a good command of the learning-teaching methods, techniques, and strategies to be employed in gaining the acquisitions, organization of the materials in compliance with the student characteristics and teaching process, previous knowledge of the student, awareness of the mistakes, difficulties, and solution suggestions that may be experienced in teaching. Although education and training planning may seem like a discrete teacher competence, it is a competence that co-ordinates many of the teacher competences identified.

An important part of education and training planning involves designing lesson plans. While designing the lesson plan, almost all of the components involved in the education and training planning competence are used. The lesson plan increases the quality of teaching (Bilen, 2002; Kablan, 2012) and the level of success (Konyalıoğlu, Konyalıoğlu, & Işık, 2002; Kablan, 2012) as it is a guide that determines the functioning in the teaching process (Özaltun Çelik & Bukova Güzel, 2017). It is crucial to develop and evaluate the competence of preparing a lesson plan as it is not only related to other competencies and but also a competence in itself. While field education courses taught in pre-service education serve to develop this competence, there is also a need for a measurement tool to be employed for the evaluation of lesson plans. In this context, this study seeks to develop a lesson plan evaluation rubric to evaluate lesson plans designed by pre-service teachers.

In the first part of the rubric development process, the relevant literature (Bilen, 2002; Jones, 2005; Ball, Sleep, Boerst, & Bass, 2009; Özaltun Çelik & Bukova Güzel, 2017) was reviewed and criteria for the evaluation of lesson plans were identified. The goal was to create a rubric by writing score specifications for the identified criteria. An expert opinion form (in form of “it is appropriate” and “it is not appropriate” was created to submit the rubric to the expert opinion. The consensus rates of the experts ranged between 0.5 and 1. Experts also expressed their opinions in writing. In line with the opinion of the first round of the expert opinion, it was observed that the criteria and specifications of the rubric needed to be arranged and the rubric was submitted to the expert opinion for the second time with the arrangements made. In the second round, the expert consensus rate was calculated as 1. This value indicates a perfect fit for consensus (Şencan, 2005). In this way, the validity of the rubric was ensured by both the literature and expert opinion (Yıldırım & Şimşek, 2013). The rubric obtained after the second round of expert opinion was applied on 42 lesson plans prepared by the pre-service teachers within the scope of the geometry and measurement teaching course. To test the reliability of the rubric, two raters independently evaluated the lesson plans. The Spearman

Brown Rank Differences coefficient between these evaluations was calculated and found ranging between 0.608 and 1.00. A rater training session was held to eliminate the inconsistency between raters following this implementation. Along with the rater training, minor arrangements were made for some of the criteria and specifications of the rubric, and the rubric took its final shape. After this session, 43 lesson plans prepared by pre-service teachers who took geometry and measurement teaching lessons were evaluated according to the final version of the rubric. The Spearman Brown Rank Differences correlation coefficient between raters for this assessment was calculated between 0.786 and 1.00. As a result, it can be suggested that the relevant lesson plan evaluation rubric is a reliable measurement tool.

In this study, a rubric was developed to evaluate lesson plans. The relevant rubric consists of three parts: imprint, functioning, and assessment-evaluation. In the imprint part, there are 11 criteria including the name of the course, grade level, subject(s), recommended course duration, learning area, sub-learning area, acquisitions, skills, learning-teaching methods and techniques, tools and materials/materials used, terms or concepts. In the functioning part, there are 9 criteria including readiness, ability to gain terms or concepts, misconceptions, being acquisition-oriented and skills-oriented, compatibility with learning-teaching methods and techniques, use of materials, roles of teacher and student, appropriateness of the language used. The assessment and evaluation part consists of 4 criteria including suitability for learning outcomes, suitability for functioning, conceptual suitability of evaluation elements, and suitability of evaluation elements in terms of grammar. The rubric can create a total score through weighting of the criteria and thus, normative studies are required. Studies can be conducted to meet this requirement. In future studies, lesson plans can be evaluated through this rubric and thus, this rubric used as an argument for measuring teacher competence. On the other hand, the specifications of the criteria can also be used as a feedback tool.

Keywords: Teacher Competence, Lesson Plan Evaluation, Rubric Development, Lesson Plan Evaluation Rubric, Mathematics Teaching.

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Examination of high school 10th grade students' proof skills in context of mathematical reasoning

Enes DEMİR

Siirt University Department of Mathematics Education, Siirt, Turkey

(ORCİD: 0000-0002-9012-8109)

Mail: enesdemir@siirt.edu.tr

Gamze IRAZ

Siirt University Department of Mathematics Education, Siirt, Turkey

Mail: gamze.iraz@hotmail.com

Abstract

In mathematics education, the method of showing the correctness of theorems and rules and convincing people is reasoning and proof, which is the heart and soul of mathematics, with its feature of reaching various generalizations or results in an axiomatic system. Based on this importance, the aim of the study is to examine the proof-making skills of high school 10th grade students in the mathematical context. One of the basic building blocks of mathematics is proof. The importance of the concept of proof is increasing day by day with the thought that the power of mathematical thinking comes from proof. Many studies conducted today show that students have low success in proving and have difficulties. Although the concept of proof may seem like a simple mathematical operation, it has more than one function in its infrastructure. In order for a student to perform a mathematical operation and reach the result, he must first understand the given operation, then examine it, make logical inferences and move on to the solution phase. With this study, it was tried to determine which stages the students used while proving, at which stage they had the most difficulty, and how well they had mastered the mathematical terms, what kind of reasoning mistakes they made. In this context, the study was carried out with a total of 60 students studying at different high schools in a city in Turkey. As a data collection tool in the study, 4 scenario-type proofs were asked,

which were formed from the literature and expert opinion appropriate to the levels of high school students. The data obtained were categorized with the reasoning errors detection scale. As a result of the analysis, it was revealed that high school students made reasoning mistakes such as accepting a special case as a proof, creating invalid proofs, using the language of mathematics correctly, inconsistency between proof steps, and they had many difficulties in writing proofs. Based on the results of this study, it is suggested that the high school curriculum requires more proving to be included and that more studies should be conducted on this.

Keywords: Proof, reasoning, mathematics education, high school students

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Piecewise modeling: Applications to Nature

Seda İĞRET ARAZ[1]

[1]sedaaraz@siirt.edu.tr, Siirt University, Faculty of Education, Department of Mathematics Education, Siirt, Turkey.

Abstract

In this study, we present some applications of a new concept called the piecewise derivative, which is useful in depicting different processes at different time intervals, such as power law, fading memory, classical. For applications, we consider well-known the logistic equation and present some applications of such model. Also, we deal with Van Der Pol equation which can be used for modeling heart rhythm of a human. We present numerical simulations different behaviors of heart rhythm and different patterns of logistic equation via piecewise concept.
Keywords: Piecewise differential operators, logistic equation, heart rhythm model.

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Investigation of The Effect of Game-Based Mathematics Teaching On Students' Motivations to Learn Mathematics

Enes DEMİR

Siirt University Department of Mathematics Education, Siirt, Turkey

Mail: enesdemir@siirt.edu.tr

Mert ARAR

Siirt University Department of Mathematics Education, Siirt, Turkey

Mail: mertarar1@gmail.com

Abstract

Mathematics lessons are one of the most important lessons in terms of gaining many important qualities such as creative, original, critical thinking, reasoning, problem solving and so on. Therefore, as a requirement of being an information society, it is necessary to create an effective and efficient mathematics teaching-learning environment in schools and other educational institutions. One of these methods can be provided with game-based mathematics education. Mathematics and games take their place in the life of the individual at different levels, with different functions and contents. In mathematics, reaching advanced abstractions and generalizations from simple concrete relations takes place at advanced levels with time and the development of the individual. In the game, the types of games played by the development of the individual differ. As time passes, the individual who encounters different situations in the game acquires different skills and develops himself. Many mathematical experiences are experienced in the game, which is a serious occupation of the child. Play is a developmental opportunity built on real-life experiences, where the foundations of mathematical thinking are laid. Based on this importance, the aim of the study is to examine the effect of game-based mathematics education on students' motivation to learn mathematics.

In line with the purpose of the study, he worked with 7th grade students (22+22) in primary education. In the study, using the quasi-experimental method, the students were divided into control group and experimental group. The researcher himself conducted the lessons of both groups. While the game-based mathematics teaching was carried out in the experimental group, the lessons were taught with the existing teaching methods and techniques in the control group. When both the post-test data and the clinical interviews with the students and the observation data made during the lessons were examined, it was determined that the teaching of mathematics with games contributed positively to the motivation of the students, and the students showed more interest in participating in the lessons more actively. It is suggested that more work should be studied on game-based mathematics teaching.

Keywords: Game, mathematics education, motivation, primary education

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Academia International Conference on Mathematics and Mathematics Education, 1-3 December 2021, Siirt, TURKEY

On f-Statistical convergence of order β of difference sequences of fractional order

Abdulkadir KARAKAŞ

Department of Mathematics, Siirt University, Siirt -TURKEY

E-mail: kadirkarakas21@hotmail.com

Abstract

In this work, we introduce the concept of f-statistical convergence of order α by using fractional difference operator Δ_p^{α} and investigate its properties. Some topological properties for this space are presented and some inclusion relations are established.

Keywords: Difference operators, Statistical Convergence, Sequence spaces, Fractional difference operators.

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An Examination of 12th Grade Students' Understanding of Central Trend And Difference Measures According to Solo Taxonomy

Enes DEMİR

Siirt University Department of Mathematics Education, Siirt, Turkey

Necmettin KORKMAZ

Siirt University Department of Mathematics Education, Siirt, Turkey

Abstract

In our society, where technology advances and spreads rapidly, information and data collection has an important place. With the increase in data collection and knowledge, people approach events from different perspectives and develop different solutions. Statistical knowledge and statistical thinking are needed in the process of evaluating and interpreting this information and data, which appear as graphics or tables in all areas of daily life. For this reason, the importance given to statistics has increased in the world and statistics subjects have taken their place in mathematics programs in many countries. The purpose of this research is to examine which meanings secondary school 12th grade students attribute to the measures of central tendency and diffusion and at what level these meanings are according to the SOLO Taxonomy. The study was conducted with 72 students who continue their education in the 12th grade in three different high schools (high, medium and low level according to academic success) in a city center in Turkey in the fall semester of the 2021-2022 academic year. 5 scenario-type questions were asked to reveal students' statistical thinking levels about central tendency and diffusion measures. In the preparation of these questions, the relevant literature was scanned and the questions were finalized by taking expert opinions. The data about the statistical thoughts of the students were obtained from the clinical interviews and the solutions of the students during the interview. The data obtained were analyzed with the descriptive analysis method under the qualitative paradigm within the framework of the Solo Taxonomy. According to the results obtained, the students' level of

understanding of central tendency measures such as range and standard deviation was low; It was observed that the level of understanding for the concept of "average" was high. The results of the study are thought to be a preliminary preparation for the studies to be carried out in this field.

Keywords: Statistical literacy, Solo Taxonomy, mathematics education, high school students

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Reflections on an In-service Training Program Designed for

Primary School Teachers

Ahmet ÇETİN, Ahmet DELİL, Bülent Nuri ÖZCAN, Mehmet Nuri ÖĞÜT, Metin GENÇAY, Hüseyin DELİL, Mine AYYILDIZ, Semra NALBANTOĞLU ve Emine ATASOY ÖZTÜRK

Celal Bayar University Department of Mathematics Education, Turkey

Abstract

This is a cooperative in-service training program between Manisa Celal Bayar University (MCBU) Faculty of Education and Şehzadeler District Directorate of National Education. It is designed to contribute to the assessment and evaluation knowledge of primary school teachers, to determine the cognitive level of a fourth-grade primary school mathematics item according to TIMSS assessment framework, to write problems in accordance with this framework at each cognitive level, and to improve their competence by applying the written items in the classroom measurement and evaluation processes. The project entitled with "Developing My Professional Skills With TIMSS" was carried out between 29.01.2021 and 26.11.2021. In this talk, information about the in-service training program is given, including the views of the participants.

Academia International Conference on Mathematics and Mathematics Education, 1-3 December 2021, Siirt, TURKEY

The Views of Some Participants of a Workshop on PWW's

Ahmet DELİL

Celal Bayar University, Department of Mathematics Education, Turkey

Abstract

This study includes details on a workshop entitled "Proof without words in mathematics education" as a part of TUBITAK 2237-A project called "Proof applications in mathematics education". The participants are graduate students from various universities in Turkey. In this study, we evaluate this workshop in the light of the participants' views.

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Teaching based on 5E learnıng model's effect on the mathematics achievement and mathematical thinking skills of 7th grade students

Mehmet Şirin KURT[a] , Halil Coşkun ÇELİK[b]

[a]Milli Eğitim Bakanlığı, Öğretmen, Diyarbakır, Türkiye.
E-mail: mehmetsirinkurt@gmail.com Orcid: 0000-0002-7155-5201

[b]Doç. Dr. Siirt Üniversitesi, Eğitim Fakültesi, Matematik Eğitimi Anabilim Dalı, Siirt, Türkiye.
E-mail: hcoskun.celik@gmail.com Orcid: 0000-0003-0056-5338

Abstract

In this study, it is aimed to examine the effect of teaching with the 5E Learning Model of the 7th grade algebra learning field on students' mathematics achievement and mathematical thinking skills. The research was carried out with 80 7th grade students in total including 40 experiment and 40 checking group students a public school in the Kayapınar district of Diyarbakır. The research was designed in a quasi-experimental design with pre-test post-test control group. Implementation part of the research lasted for 6 weeks. During the implementation process, the lessons were taught with the experimental group with the lesson plans developed according to the 5E Learning Model, while the lessons were taught according to the existing teaching methods in the control group. It is planned for the "achievement test of designing the data of the research for singular expressions" and thinking about mathematical thinking" independent samples t-test and dependent samples t-test were used in the analysis of the obtained data. As a result of the research, it was concluded that education with the 5E Learning Model increased the mathematics achievement of the students in the field of algebraic learning. There is a significant difference between the mean scores of students' mathematical thinking skills; It was determined that the effects of mathematical thinking were more in the experimental group than the students in the control group. It can be said that the 5E Learning Model makes a more positive contribution to the development of students' mathematical thinking skills. Although the examples of the 5E Learning Model in the field of mathematics are restricted, its applications in mathematics education give

successful results. Therefore, this model may increase its applications in other subjects in the field of mathematics training. It is hoped that these research findings will contribute significantly to better revealing the profiles of students in studies to be carried out based on 5E learning approaches.

Keywords: Mathematics achievement, Mathematics education, Mathematical thinking, Secondary school students.

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Examination of secondary school students' mathematical metacognitive awareness according to some variables

İsmail ARSLAN[a] , Halil Coşkun ÇELİK[b]

[a]Milli Eğitim Bakanlığı, Öğretmen, Mardin, Türkiye. E-mail: ismailarslan@siirt.edu.tr Orcid: 0000-0002-6282-8095

[b]Doç. Dr. Siirt Üniversitesi Eğitim Fakültesi, Matematik Eğitimi Anabilim Dalı, Siirt, Türkiye. E-mail: hcoskun.celik@gmail.com Orcid: 0000-0003-0056-5338

Abstract

In this study, secondary school students' mathematical metacognitive awareness were examined. It was examined whether there was a significant difference in terms of gender, class, socio-economic status of the family and education level of the parents on mathematics achievement. The research was carried out with a descriptive research model. The study was carried out on 462 (246 Girls, 216 Boys) students selected by convenient sampling method among secondary school students studying at 5th, 6th, 7th and 8th grades in a public school. "Personal Information Form" were used for the data collection tool and the "Mathematical Metacognition Awareness Scale" to reveal their mathematical metacognition awareness. Independent sample t-test, one-way analysis of variance were used in the analysis of the data. According to the results obtained from the research, it was found that students' mathematical metacognitive awareness were sufficient and at a high level. It was determined that students' mathematical metacognitive awareness differed significantly in terms of gender and mathematics achievement, but did not show a significant difference according to class, socio-economic status of the family, and education level of the parents. Activities to develop or increase students' awareness of mathematical metacognition should be prepared by paying attention to gender and mathematics achievement differences.

Keywords: Mathematical metacognition, Mathematics Achievement, Metacognitive awareness, Secondary school students

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On the existence of periodic solutions of a nonlinear functional differential equation

İrem AKBULUT ARIK*, Cemil TUNÇ**

¿Siirt University, Faculty of Education, Department of Mathematics Education, Siirt, Turkey

**Yuzuncu Yil University, Faculty of Sciences, Department of Mathematics , 65080, Van, Turkey

Abstract

In this paper, we investigate the existence of periodic solutions of a nonlinear functional differential equation with variable delay. First, we transform the considered problem to an equivalent integral equation. Then, we define a fixed point mapping, which is written as a sum of contraction, and a compact map. Hence, we prove some results on the existence of periodic solution of the considered problem. The technique of the proofs depends on the Krasnoselskii's fixed point theorem. We give some examples for illustrations. By this work, we aim to do some contributions to the relevant topic and literature.

Keywords: Functional differential Equation, Fixed Point Theorem, Variable Delay.

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Predicting Mathematics Achievement: The Role of Mathematical Metacognition and Problem-Posing Self-Efficacy

Halil Coşkun ÇELİK[a] , İsmail ARSLAN[b]

[a]Doç. Dr. Siirt Üniversitesi Eğitim Fakültesi, Matematik Eğitimi Anabilim Dalı, Siirt, Türkiye. E-mail: hcoskun.celik@gmail.com Orcid: 0000-0003-0056-5338

[b]Milli Eğitim Bakanlığı, Öğretmen, Mardin, Türkiye. E-mail: ismailarslan@siirt.edu.tr Orcid: 0000-0002-6282-8095

Abstract

Metacognition is the ability of students to have knowledge about their own thinking processes and cognition and to organize this structure. Since metacognition is a method of discovering or choosing a specific mental process in the problem-solving process, it also has important effects on mathematical problem posing and achievement. This study explains the role of mathematical metacognitive awareness and problem posing in explaining mathematics achievement. In the study, middle school students' awareness of mathematical metacognition and self-efficacy in posing a mathematical problem were determined, and the relationship between them and their mathematics achievement was examined. The study, which was designed in the relational screening model, was conducted on 462 secondary school students. Data were collected through the "Problem Posing Self-Efficacy Scale" and the "Mathematical Metacognition Awareness Scale". Pearson Product Moments Correlation coefficient and Multiple Linear Regression Analysis method were used to analyze the data. According to the results obtained from the study, a moderately significant relationship was found between students' mathematical metacognitive awareness and their self-efficacy in posing mathematical problems and their mathematics achievement. In addition, it was determined that students' mathematical metacognitive awareness and problem-posing self-efficacy predicted their mathematical success at the level of 35%. The results of this study point to the need to explore the importance of metacognition and problem posing as an important element in students' success in mathematics. The findings of the correlations between mathematical

metacognition, problem posing self-efficacy, and mathematics achievement suggest a possible focus for further research.

Keywords: Achievement, Mathematics education, Metacognition, Problem posing, Self-efficacy.

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Examining Preservice Elementary Mathematics Teachers' Pedagogical Content Knowledge on Patterns in Terms of Students' Errors

Filiz Tuba DİKKARTIN ÖVEZ
Balıkkesir University Department of Mathematics Education Turkey

İlayda İNCE
Balıkkesir University Department of Mathematics Education Turkey

Abstract

The aim of this study is to examine primary school mathematics teacher candidates' pedagogical content knowledge about patterns in terms of student errors. 76 primary school mathematics teacher candidates studying in an education faculty in western Turkey and selected by convenient sampling method participated in the study. The study was based on case study, one of the qualitative research approaches. In order to collect the data of the study, the scale of "Pre-service Teachers' Knowledge of Students about Errors in the Subject of Patterns" developed by the researchers was used. Content analysis technique, one of the qualitative research methods, was used in the analysis and interpretation of the data. In the study, it was seen that the primary school mathematics teacher candidates did not have difficulty in detecting student mistakes and the reason for the error, their knowledge of recognizing pattern generalization strategies was high, and in this context, their pedagogical content knowledge about patterns was at a sufficient level. In addition, it was seen that they were more successful than quadratic patterns in finding the linear pattern rule, but they mostly made immature inductive reasoning while finding the pattern rule, and they were not at the desired level at Radford's algebraic generalization level.

Keywords: pattern, pedagogical content knowledge, error, pre-service mathematics teachers

Academia International Conference on Mathematics and Mathematics Education, 1-3 December 2021, Siirt, TURKEY

Examination of Teacher's Opinions on Teaching Multiplication Tables

Cahit PESEN

Siirt University Department of Mathematics Education, Siirt, Turkey

Abstract

The aim of this research is to examine the views of teachers about multiplication table teaching and the multiplication table models used in teaching and to put forward suggestions for teaching based on the results. The multiplication table, which includes multiplication operations with one-digit natural numbers, is encountered by students starting from the 2nd grade of primary school. The process of learning the multiplication table is expected to be completed in the 3rd grade. Most primary school students make mistakes in simple multiplication or division operations because they have trouble learning the multiplication tables. This often leads to frustration, low self-esteem, lack of confidence and loss of interest in math.

Academia International Conference on Mathematics and Mathematics Education, 1-3 December 2021, Siirt, TURKEY

Some Recent Development in OCDMA system and mathematical modeling

Kottakkaran Soopy Nisar[1]

[1]Department of Mathematics, Prince Sattam bin Abdulaziz University, Saudi Arabia

Abstract

The lustre of heuristic techniques inspires the researchers to develop computing infrastructures for handling the uncertainties that arise in the future prediction and control of COVID-19 spread virus, HIV infection of CD4+T cells model, Hantavirus model, HCV infection spread model, tumour growth model and other infectious diseases. Soft computing heuristics can handle the misleading situations in predicting and understanding the pandemic spread by designing the paradigms with more reliability, accuracy, precision and prediction of the bio-mathematics models. Based on the above fact, the recent development of mathematical modeling and its applications are considered in this talk.

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Impact of information and Lévy noise on stochastic COVID-19 epidemic model

Anwarud Din[1]

[1]Department of Mathematics, Sun Yat-sen University, Guangzhou 510275, China

Abstract

In this paper, we consider the dynamical behavior of a stochastic coronavirus (COVID-19) epidemic model SIR with the inclusion of the influence of information intervention and Lévy noise. The existence and uniqueness of the model positive solution are proved. Then, we establish a stochastic threshold as a sufficient condition for the extinction and persistence in mean of the disease. Based on the available COVID-19 data, the parameters of the model were estimated and we fit the model with real statistics. Finally, numerical simulations are presented to support our theoretical results.

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A Fractional Mathematical Model of the ongoing Coronavirus Disease (COVID-19) Pandemic: A Case Study in Thailand

Idris Ahmed[1]

[1]Department of Mathematics, Sule Lamido University, P. M. B 048 Kafin-Hausa, Jigawa State, Nigeria.

Abstract

Since it was first identified in Wuhan, China, at the end of 2019, the coronavirus disease (COVID-19) pandemic has become a growing threat to global health. The epidemic emerged in Thailand in January 2020, with the Ministry of Public Health (MOPH) reporting the first cases in Bangkok. Mathematical modeling has been an effective method in understanding infectious disease transmission. In this paper, a compartmental epidemic model comprised of a system of six nonlinear differential equations with intervention strategy were propose and study to examines the transmission dynamics of the COVID-19 pandemic with reported data on daily cases of coronavirus in Thailand. The non-negativity and boundedness of the solutions were investigated, demonstrating that the model under consideration is mathematically and epidemiologically well-posed. Furthermore, using the concept of the next-generation matrix, we calculate the basic reproduction number and evaluate its stability. Furthermore, the proposed model was fitted with commutative and new daily cases from Thailand to validate and estimate some model parameters. To determine the impact of different parameters on R_{0}, sensitivity analysis were investigated. To support the analytical results, an effective numerical scheme was employed to explore the dynamic behavior of the model.

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Power series representing posets

Eric Dolores Cuenca[a], Jose Antonio Arciniega-Nevarez[b], Marko Berghoff [c]

[a] Division de Ingenierıas, Universidad de Guanajuato, Guanajuato, Mexico

[b] Mathematical Institute, University of Oxford, Oxford, UK

[c] Department of mathematics, Yonsei University, Seoul, Korea

Abstract

In this work we rewrite the theory of order polynomials by using power series methods instead of polynomial methods. As a result we discover a non-recursive algorithm to compute the values of order polynomials of series-parallel posets. Given a power series $f(x)$, we describe an algorithm to recover, if possible, a poset whose order series is the power series $f(x)$. We introduce a family of posets, called Wixárika posets, and show that they satisfy a new variant of Stanley's reciprocity theorem. As an application we obtain new identities for binomial coefficients and properties of the negative hypergeometric distribution.

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On the Stability of Nonlinear of Neutral Integro-Differential Equations

Melek Gözen

Department of Business Administration Faculty of Management Van Yuzuncu Yil University 65080, Erciş –Van, TURKEY, E-mail: melekgozen2013@gmail.com

Cemil Tunc

Department of Mathematics Faculty of Sciences Van Yuzuncu Yil University 65080-Kampus Van- Turkey, E-mail: cemtunc@yahoo.com

Abstract

This works deals with a nonlinear system of neutral delay integro-differential equations. Here, the asymptotically stability of solutions is studied. New results on the asymptotically stability of solutions are obtained by defining and using two new Lyapunov- Krasovskiĭ functionals. The results of this paper generalize some former results and include them under weaker conditions. This paper also gives some new contributions to the theory of fundamental properties of solutions of neutral integro-differential equations.

Keywords: Asymptotic stability; Lyapunov functional; neutral integro-differential equations; linear matrix inequality

Mathematics Subject Classifications: 34K20; 34K40; 34K45; 93D30

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A Uniformly Convergent Difference Scheme for Singularly Perturbed Fredholm Integro-Differential Equation on Shishkin Mesh

Muhammet Enes DURMAZ,[1] Mustafa KUDU[2] and Gabil M. AMIRALIYEV[2]

[1]Department of Information Technology, Kırklareli University, Kırklareli-TURKEY

[2]Department of Mathematics, Faculty of Science and Arts, Erzincan Binali Yıldırım University, Erzincan-TURKEY

menesdurmaz025@gmail.com

muskud28@yahoo.com

gabilamirali@yahoo.com

Abstract

In the present study, the initial-value problem for a linear first-order singularly perturbed Fredholm integro-differential equation (SPFIDE) has been considered. By using interpolation quadrature rules and an exponential basis function, a difference scheme has been constructed with an accuracy of $O\left(N^{-2}\ln N\right)$ on a special non-uniform (Shishkin) mesh, where N is the mesh parameter. The difference scheme is demonstrated to be stable and convergent in the discrete maximum norm. The numerical example indicates that the proposed method has a convenient approach qualification.

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A new family of the $k-¿$Fibonacci polynomials

Engin ÖZKAN[1] and Tuğba ALP[2]

[1]Department of Mathematics, Faculty of Sciences and Arts, Erzincan Binali Yıldırım University, Yalnızbağ Campus, 24100, Erzincan, Turkey.

[2]Department of Mathematics, Graduate School of Natural and Applied Sciences, Erzincan Binali Yıldırım University, Yalnızbağ Campus, 24100, Erzincan, Turkey.

Abstract

The Fibonacci numbers, which have an important place today, appear not only in mathematics, but also in every aspect of our daily life. It is a number that is seen in nature, in the stock market, in the human body and in all areas of life and is associated with aesthetics.

The Fibonacci numbers, which have an increasing place in scientific studies and are the most well-known among the number sequences, first appeared in Leonardo Fibonacci's book 'Liber Abaci', which contains many basic problems, in a rabbit problem. Fibonacci numberswere obtained by writing down the total number of rabbits per month, with the new rabbits born by breeding only once a month, of a baby female and a male rabbit at the beginning. This sequence, which is obtained by adding the two numbers before it; It continues as 1,1,2,3,5,8,13,21,34,55,89,144,23, 377, . . .

In this paper, we define a new family of k-Fibonacci Polynomials. We give the relationship between known Fibonacci Polynomials and $k-¿$Fibonacci Polynomials. We present some properties and the matrix presentations of these polynomials. Finally, we give Cassini's identity for the polynomials.

Keywords: k-Fibonacci Numbers, k-Fibonacci Polynomials, Cassini Identity, a Matrix Generator.

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A fractional mathematical model of tumor virus dynamics and treatment using virotherapy

Elif DENK[1], Seda İĞRET ARAZ[2]

[1]Siirt University, Art and Science Faculty, Department of Mathematics, Siirt, Turkey

[2]Siirt University, Faculty of Education, Department of Mathematics Education, Siirt, Turkey

Abstract

Virotherapy is the cancer treatment that use a virus to find and destroy cancer cells without harming healthy cells. A mathematical model depicting such a process include the classes of infected tumor cells, uninfected tumor cells, effector T-cells and virions. To better understand and analyze this process, we solve this model with fractional differential operators. The numerical simulations for the considered model are performed for different values of fractional order.

Keywords: Tumor growth model, virotherapy, fractional derivative and integral, numerical scheme.

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Numerical solution of a fractional model of Covid-19 spread with non-total immunity

Bünyamin KORKMAZER[1], Seda İĞRET ARAZ[2]

[1]Siirt University, Art and Science Faculty, Department of Mathematics, Siirt, Turkey

[2]Siirt University, Faculty of Education, Department of Mathematics Education, Siirt, Turkey

Abstract

In this study, we deal with the numerical solution of a mathematical model about Covid-19 spread including fractional differential operators that are power-law, exponential decay and Mittag-Leffler kernel. Model includes 5 classes which are susceptible, symptomatic, asymptomatic, recovered and death classes. Such model is solved by a numerical scheme based on Newton polynomial. The numerical simulations for this model are depicted for different values of fractional order.

Keywords: Covid-19 model, numerical scheme, fractional differentiation and integration.

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Transfer Functions by New General Integral Transform

Ali Akgül

Siirt University, Art and Science Faculty, Department of Mathematics, 56100 Siirt, Turkey

aliakgul@siirt.edu.tr

Abstract

In this work, we apply the new general integral transform to obtain the Transfer functions. The obtained Transfer functions are new in the literature. Therefore, they will be very useful for mathematicians and engineers. We use power-law, exponential-decay and Mittag-Leffler kernels.

We present the applications of the circuit problems by the new general integral transform. In the circuit problems, we check the effect of the three different kernels. We demonstrate the numerical simulations to prove the efficiency of the general integral transform. We use many integral transforms and obtain very interesting transfer functions.

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The cubic B-spline polynomials approach for numerical solutions of Bagley-Torvik and Painlevé differential equations involving the Caputo-Fabrizio derivative

Omar Abu Arqub [1,*], Ahlem Ben Rabah [2]

[1] Department of Mathematics, Al-Balqa Applied University, Salt 19117, Jordan

[2] Department of Mathematics, Faculty of Science, The University of Jordan, Amman 11942, Jordan

[*]Corresponding author: Omar Abu Arqub, e-mail: o.abuarqub@bau.edu.jo

Abstract

In this present article, the well-known Bagley--Torvik equation, which is a special kind of fractional differential equations and Painlevé equations which have a significant role in fractional calculus are solved by cubic B-spline polynomials which are utilized as basis functions in a collocation plan. Applying the collocation points, defining the desired solution and its fractional derivative which is it in the Caputo-Fabrizio sense in sum forms, and matrix operations, our improved proposed technique transforms the initial value problem for the Bagley--Torvik and Painlevé fractional differential equations into a scheme of linear and nonlinear algebraic equations. The accuracy, convergence rate, and computational complexity of the scheme are analyzed based on a large number of independent runs and their comprehensive statistical analysis. The comparative studies of the results obtained are made with Mathematica11 solutions.

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Reliable Structure Preserving Numerical Analysis of Epidemic Models

Muhammad Rafiq[1]

[1]Departmernt of Mathematics, Faculty of Sciences, University of Central Punjab, Lahore, Pakistan

E-mail: m.rafiq@ucp.edu.pk

Abstract

The models for transmission dynamics of infectious diseases are non-linear and hard to solve analytically. Some authors proposed semi-analytic and exact solutions of epidemic models. These solutions have some serious flaws and do not exhibit the true dynamics of an infectious disease in a population. In this work, a reliable numerical analysis for epidemic models is presented which preserves all the essential features of the continuous model. The proposed numerical analysis remains consistent with the biological nature of epidemic models in all scenarios.

Keywords: Epidemic Model; Exact Solution; Numerical Analysis; Structure Preserving

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Applications of Lie groups and Lie algebras in numerical methods

Mir Sajjad Hashemi[1]

[1]Department of Mathematics, Basic Science Faculty, University of Bonab, P.O. Box 55513-95133, Bonab, Iran.

Email: hashemi_math396@yahoo.com

Abstract

Differential equations play an important role in applied mathematics and are omnipresent in the sciences and in technical applications. They appear in many different fields such as chemical reaction kinetics, molecular dynamics, electronic circuits, population dynamics, control theory and astrodynamical problems, to name just a few. However, since the early days of the subject, it has become evident that very often finding closed solutions is either simply impossible or extremely difficult. Therefore, computing or approximating solutions of differential equations, fractional, partial as well as ordinary, linear or nonlinear, constitutes a crucial ingredient in all mathematical sciences. Very often in applications, the differential equation modeling the physical phenomenon one aims to study possesses qualitative (geometric) properties that are absolutely essential to preserve under discretization. Starting from the case of symplectic integration, the search for numerical integration methods that preserve the geometric structure of the problem was generalized to other types of differential equations possessing a special structure worth being preserved under discretization. Examples include volume preserving systems, differential equations defined in Lie groups and homogeneous manifolds, systems possessing symmetries or reversing symmetries, etc. I nthis talk, we present some novel geometric numerical integration techniques which can be developed for many other kind of differential equations.

Keywords: Numerical method, Geometric integration, Lie group, Lie algebra.

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Optimal balls of classical and stochastic systems of nonlinear partial differential equations

Muhammad Sajid Iqbal[1]

[1]Department of Mathematics and Statistics, The University of Lahore, Pakistan

Abstract

The solutions of nonlinear partial differential equations (PDEs), in general, lie in the function spaces. The presence of chaos or noise in a PDE leads to the loss of the usual regularity properties. The current research provides the junction of exact solutions and the a-priori explicit estimates describing the maximum length of continuity of solutions of under nonlinear dynamical problems for stochastic PDEs. Another contribution is the common continuity of the solution of underlying system of nonlinear partial differential equations.

Academia International Conference on Mathematics and Mathematics Education, 1-3 December 2021, Siirt, TURKEY

Common fixed points technique in complex valued b-metric spaces

Liliana Guran[1], Monica Felicia Bota[2]

Abstract

In this paper, we introduce fixed theorem for a general contractive condition in complex valued b-metric spaces. Also some corollaries under this contrctive condition are obtained. As applications, we give a section applying our results in the case on integral type contractions. Moreover, we find a unique solution for Urysohn intgeral type equations system and an illustrative example is given to support our obtaining results. Our results extend eand generalize the results of Rao et. al. [7] and some known results in the literature.

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LILIANA GURAN,
VASILE GOLDI¸S WESTERN UNIVERSITY OF ARAD, ROMANIA.,
Email address: guran.liliana@uvvg.ro.

MONICA FELICIA BOTA,
DEPARTMENT OF MATHEMATICS, BABE¸S-BOLYAI UNIVERSITY, CLUJ-NAPOCA, ROMANIA.,
Email address: monica.bota@ubbcluj.ro.

2010 *Mathematics Subject Classification.* 47H10; 54H25.

Key words and phrases. fixed point, common fixed point, complex valued *b*-metric space, Urysohn integral equations system.

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Application of Fractional Order Techniques on Diabetes Model

Dr. Muhammad Farman

Department of Mathematics and Statistics, University of Lahore, Lahore-54590, Pakistan.

Abstract:

We formulate a fractional-order mathematical model for the populations of diabetic patients consist three-compartment G, X, and I. The fractal-fractional diabetes Model is investigated with the ABC technique using Sumudu transform, Atangana-Toufik techniques for normal and type type-1 diabetes. Also, the deterministic mathematical model for diabetes mellitus is investigated with the effect of the fractional parameters. Solutions are derived to investigate the influence of fractional operator which shows the impact of the disease for type-1 diabetes. The existence and uniqueness results of the fractional-order model are derived using fixed point theory. Also, an error analysis has been made for the proposed scheme. We suggest an impulsive differential equation model study plasma glucose control for diabetic patients with impulsive insulin injections. It is regarded as a deterministic mathematical model related to the diabetes mellitus fractional derivatives. Simulation has been made for developed solutions of fractional order diabetes model to check the actual behavior of a normal person as well as a type-1 diabetes patient. The results of these case studies indicate that this plasma glucose control of the fractional-order model is an appropriate candidate.

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Numerical Analysis of a Non-Linear Stochastic Epidemic Model

Ali Raza

Department of Mathematics, National College of Business Administration & Economics, Lahore, Pakistan

Department of Mathematics, Govt. Maulana Zafar Ali Khan Graduate College Wazirabad, Punjab Higher Education Department Lahore, Pakistan

*E-mail: alimustasamcheema@gmail.com

Abstract

The nature of epidemic growth and spread is inherently random due to the unpredictability of person-to-person contacts. It is essential to include this randomness in models for emerging infectious diseases. Stochastic models could be a more appropriate way of modeling epidemics in many circumstances. The Euler Maruyama, Milstein, and many more methods are widely used in literature to solve highly nonlinear stochastic differential equations (SDE's). Unfortunately, the methods mentioned above are not reliable for restoring the structure of the continuous model's positivity, boundedness, and dynamical consistency. Moreover, these methods are not consistent with the nature of biological properties. So, to overcome these issues, the proposed numerical method, like the non-standard finite difference in the sense of stochastic, is designed to preserve the continuous model's structure and remain consistent with its biological nature.

Academia International Conference on Mathematics and Mathematics Education, 1-3 December 2021, Siirt, TURKEY

Dynamical Behaviour of Smoking Model

Anwar Zeb[1]

[1]Department of Mathematics, COMSATS University Islamabad, Abbottabad Campus, Pakistan

Abstract

In this talk, first, we present a new smoking mathematical model for which the interaction term is the square root of potential and occasional smokers. Then discuss the local and global stability of proposed model. Finally, show the numerical results graphically.

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Analysis of system of differential equations

Nourhane Attia

Abstract

In the present research, a system of fractional differential equations has been examined with the help of reproducing kernel Hilbert space method. This important fractional model helps us to understand the interaction between the predator and prey. We make use of the Caputo fractional derivative. The technique employed to construct new numerical solutions for the considered model, which is presented as a system of two fractional ordinary differential equations. The solution methodology is based on the use of two important Hilbert spaces, as well as on the construction of a normal basis through the use of the Gram-Schmidt orthogonalization process. The computational results show the effect of the fractional derivative in the obtained results the superior performance of the proposed method.

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Fractional stochastic inequalities involving p-convex stochastic process

Auwalu Hamisu Usman, Usa Wannasingha Humphries

Abstract

The main objective of this article is to derive a new fractional refinement of Hermite-Hadamard's inequality using p-convex stochastic processes essentially involving a new generalized stochastic mean-square fractional integrals. A new identity involving generalized stochastic mean-square fractional integrals is obtained. Using this identity some new estimates of upper bounds involving p-convex stochastic processes are also obtained. 2010 Mathematics Subject Classification: 26A51, 26D15, 26A33.

Keywords: p-convex stochastic processes, inequality, fractional, Hermite-Hadamard

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Numerical Solutions of a Heat Transfer for Fractional Maxwell Fluid Flow with Water Based Clay Nanoparticles; A Finite Difference Approach

Muhammad Imran Asjad

Abstract

Fractional-order mathematical modeling of physical phenomena is the hot topic among the researcher because it has many advantages over the positive integer mathematical modeling. In this context, the appropriate solutions of such fractional-order physical modeling become a challenging task among scientists. This paper presents the study of unsteady free convection fluid flow and heat transfer of Maxwell with the presence of Clay nanoparticle modeling using fractional calculus. The obtained model transformed into a set of linear non-dimensional partial differential equations (PDEs). The finite difference scheme proposed to discretize the obtained set of non-dimensional PDEs. Maple code was developed and executed against the physical parameters and fractional-order parameters in order to see the behavior of velocity and temperature profiles. Some limiting solutions are obtained and compared with the latest existing ones in literature. The comparative study witnesses that the proposed scheme is a very efficient tool to handle such a physical model and can be extended to more diversified problems of complex nature.

Keywords: Numerical method; Fractional Calculus; Nanoparticles; Maxwell fluid; Heat transfer

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Weber-Type Integral Transform Connected with Robin-Type Boundary Conditions

Nehad Ali Shah

Abstract

A new Weber-type integral transform and its inverse are defined for the representation of a function $f(r,t),(r,t)\in[R,1]\times[0,\infty)$ that satisfies the Dirichlet and Robin-type boundary conditions $f(R,t)=f_1(t)$, $f(1,t)-\alpha\left.\frac{\partial f(r,t)}{\partial r}\right|_{r=1}=f_2(t)$, respectively.

The orthogonality relations of the transform kernel are derived by using the properties of Bessel functions. The new Weber integral transform of some particular functions has been determined. The integral transform defined is a suitable tool for determining analytical solutions of the transport problems with sliding phenomena that often occur into flows through micro channels, pipes or blood vessels.

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Application of fractional derivatives

Harendra Singh

Abstract

In this lecture, we will discuss about the different types of fractional derivatives. We will compare these derivatives and show which one is better in compare to the other. We will also discuss some applications of fractional derivatives in science and engineering.