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Journal of Fractional Calculus and Applications is a peer-reviewed international electronic journal, which publishes both surveys/reviews and research articles on the fields of fractional-order differential and integral equations and its applications in all fields of Science.

Journal of Fractional Calculus and Applications

Fractional Calculus and Applied Analysis (FCAA, abbreviated in the World databases as Fract. Calc. Appl. Anal. or FRACT CALC APPL ANAL) is a specialized international journal for theory and applications of an important branch of Mathematical Analysis (Calculus) where differentiations and integrations can be of arbitrary non-integer order.

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Fractional calculus is allowing integrals and derivatives of any positive order (the term fractional is kept only for historical reasons) [5] [6] [7]. It can be considered a branch of mathematical physics that deals with integral-differential equations, where integrals are of convolution type and exhibit mainly singular kernels of power law or logarithm type.

Fractional Calculus, Fractional Differential Equations and ...

Description. Fractional calculus (FC) is an emerging field of mathematics in an applications points of view, and it is applicable for almost all branches of applied sciences. It deals with the investigation and application of integrals and derivatives of arbitrary order. The combination of generalized FC and special functions are used to obtain potential results in the field of applied mathematics.

Fractional Calculus and Related Inequalities | Hindawi

This monograph provides a comprehensive overview of the author's work on the fields of fractional calculus and waves in linear viscoelastic media, which includes his pioneering contributions on the applications of special functions of the Mittag-Leffler and Wright types. It is intended to serve as a general introduction to the

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Fractional calculus extends the order of integer order calculus from integer to non-integer. Fractional order models based on fractional calculus can describe nature characteristics and property behavior of real-time systems more accurately. At present, fractional calculus has been widely used in various fields [2, 3, 4, 5, 6, 7]. It can be used to represent dynamic course of the system which cannot be described accurately by integer order system.

Formalization of fractional calculus and fractional order ...

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Fractional calculus is allowing integrals and derivatives of any positive order (the term fractional is kept only for historical reasons). It can be considered a branch of mathematical physics that deals with integro-differential equations, where integrals are of convolution type and exhibit mainly singular kernels of power law or logarithm type.

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Journal of Fractional Calculus and Applications is a peer-reviewed international electronic journal, which publishes both surveys/reviews and research articles on the fields of fractional-order differential and integral equations and its applications in all fields of Science. A significant emerging area of research activity covers:

Journal of Fractional Calculus and Applications | Publons

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Fernandez, C. Ustao?lu, "On some analytic properties of tempered fractional calculus", Journal of Computational and Applied Mathematics 366 (2020), 112400. DOI: 10.1016/j.cam.2019.112400 Fernandez, D. Baleanu, H.M. Srivastava, "Corrigendum to "Series representations for fractional-calculus operators involving generalised Mittag-Leffler ...

Fractional Calculus | Department of Mathematics - EMU

Fractional Calculus and Applied Analysis - Journal Impact. The Journal Impact 2019-2020 of Fractional Calculus and Applied Analysis is 3.690, which is just updated in 2020. Compared with historical Journal Impact data, the Metric 2019 of Fractional Calculus and Applied Analysis grew by 21.38% . The Journal Impact Quartile of Fractional Calculus and Applied Analysis is Q1 .

Fractional Calculus and Applied Analysis Journal Impact ...

Fractional calculus is a branch of mathematical analysis that studies the several different possibilities of defining real number powers or complex number powers of the differentiation operator D = (),and of the integration operator J = ? (),and developing a calculus for such operators generalizing the classical one.. In this context, the term powers refers to iterative application of a ...

Fractional calculus - Wikipedia

Abstract This paper deals with recent applications of fractional calculus to dynamical systems in control theory, electrical circuits with fractance, generalized voltage divider, viscoelasticity, fractional-order multipoles in electromagnetism, electrochemistry, tracer in fluid flows, and model of neurons in biology.

Fractional Calculus and Fractional Processes with Applications to Financial Economics presents the theory and application of fractional calculus and fractional processes to financial data. Fractional calculus dates back to 1695 when Gottfried Wilhelm Leibniz first suggested the possibility of fractional derivatives. Research on fractional calculus started in full earnest in the second half of the twentieth century. The fractional paradigm applies not only to calculus, but also to stochastic processes, used in many applications in financial economics such as modelling volatility, interest rates, and modelling high-frequency data. The key features of fractional processes that make them interesting are long-range memory, path-dependence, non-Markovian properties, self-similarity, fractal paths, and anomalous diffusion behaviour. In this book, the authors discuss how fractional calculus and fractional processes are used in financial modelling and finance economic theory. It provides a practical guide that can be useful for students, researchers, and quantitative asset and risk managers interested in applying fractional calculus and fractional processes to asset pricing, financial time-series analysis, stochastic volatility modelling, and portfolio optimization. Provides the necessary background for the book's content as applied to financial economics Analyzes the application of fractional calculus and fractional processes from deterministic and stochastic perspectives

This multi-volume handbook is the most up-to-date and comprehensive reference work in the field of fractional calculus and its numerous applications. This first volume collects authoritative chapters covering the mathematical theory of fractional calculus, including fractional-order operators, integral transforms and equations, special functions, calculus of variations, and probabilistic and other aspects.

This book is a landmark title in the continuous move from integer to non-integer in mathematics: from integer numbers to real numbers, from factorials to the gamma function, from integer-order models to models of an arbitrary order. For historical reasons, the word 'fractional' is used instead of the word 'arbitrary'. This book is written for readers who are new to the fields of fractional derivatives and fractional-order mathematical models, and feel that they need them for developing more adequate mathematical models. In this book, not only applied scientists, but also pure mathematicians will find fresh motivation for developing new methods and approaches in their fields of research. A reader will find in this book everything necessary for the initial study and immediate application of fractional derivatives fractional differential equations, including several necessary special functions, basic theory of fractional differentiation, uniqueness and existence theorems, analytical numerical methods of solution of fractional differential equations, and many inspiring examples of applications. A unique survey of many applications of fractional calculus Presents basic theory Includes a unified presentation of selected classical results, which are important for applications Provides many examples Contains a separate chapter of fractional order control systems, which opens new perspectives in control theory The first systematic consideration of Caputo's fractional derivative in comparison with other selected approaches Includes tables of fractional derivatives, which can be used for evaluation of all considered types of fractional derivatives

Fractional calculus is a collection of relatively little-known mathematical results concerning generalizations of differentiation and integration to noninteger orders. While these results have been accumulated over centuries in various branches of mathematics, they have until recently found little appreciation or application in physics and other mathematically oriented sciences. This situation is beginning to change, and there are now a growing number of research areas in physics which employ fractional calculus. This volume provides an introduction to fractional calculus for physicists, and collects easily accessible review articles surveying those areas of physics in which applications of fractional calculus have recently become prominent. Contents:An Introduction to Fractional Calculus (P L Butzer & U Westphal)Fractional Time Evolution (R Hilfer)Fractional Powers of Infinitesimal Generators of Semigroups (U Westphal)Fractional Differences, Derivatives and Fractal Time Series (B J West & P Grigolini)Fractional Kinetics of Hamiltonian Chaotic Systems (G M Zaslavsky)Polymer Science Applications of Path-Integration, Integral Equations, and Fractional Calculus (J F Douglas)Applications to Problems in Polymer Physics and Rheology (H Schiessel et al.)Applications of Fractional Calculus Techniques to Problems in Biophysics (T F Nonnenmacher & R Metzler)Fractional Calculus and Regular Variation in Thermodynamics (R Hilfer) Readership: Statistical, theoretical and mathematical physicists. Keywords:Fractional Calculus in PhysicsReviews: "This monograph provides a systematic treatment of the theory and applications of fractional calculus for physicists. It contains nine review articles surveying those areas in which fractional calculus has become important. All the chapters are self-contained." Mathematics Abstracts

This work aims to present, in a systematic manner, results including the existence and uniqueness of solutions for the Cauchy Type and Cauchy problems involving nonlinear ordinary fractional differential equations.

The book is devoted to recent developments in the theory of fractional calculus and its applications. Particular attention is paid to the applicability of this currently popular research field in various branches of pure and applied mathematics. In particular, the book focuses on the more recent results in mathematical physics, engineering applications, theoretical and applied physics as quantum mechanics, signal analysis, and in those relevant research fields where nonlinear dynamics occurs and several tools of nonlinear analysis are required. Dynamical processes and dynamical systems of fractional order attract researchers from many areas of sciences and technologies, ranging from mathematics and physics to computer science.

General Fractional Derivatives: Theory, Methods and Applications provides knowledge of the special functions with respect to another function, and the integro-differential operators where the integrals are of the convolution type and exist the singular, weakly singular and nonsingular kernels, which exhibit the fractional derivatives, fractional integrals, general fractional derivatives, and general fractional integrals of the constant and variable order without and with respect to another function due to the appearance of the power-law and complex herbivores to figure out the modern developments in theoretical and applied science. Features: Give some new results for fractional calculus of constant and variable orders. Discuss some new definitions for fractional calculus with respect to another function. Provide definitions for general fractional calculus of constant and variable orders. Report new results of general fractional calculus with respect to another function. Propose news special functions with respect to another function and their applications. Present new models for the anomalous relaxation and rheological behaviors. This book serves as a reference book and textbook for scientists and engineers in the fields of mathematics, physics, chemistry and engineering, senior undergraduate and graduate students. Dr. Xiao-Jun Yang is a full professor of Applied Mathematics and Mechanics, at China University of Mining and Technology, China. He is currently an editor of several scientific journals, such as Fractals, Applied Numerical Mathematics, Mathematical Modelling and Analysis, International Journal of Numerical Methods for Heat & Fluid Flow, and Thermal Science.

When a new extraordinary and outstanding theory is stated, it has to face criticism and skepticism, because it is beyond the usual concept. The fractional calculus though not new, was not discussed or developed for a long time, particularly for lack of its application to real life problems. It is extraordinary because it does not deal with 'ordinary' differential calculus. It is outstanding because it can now be applied to situations where existing theories fail to give satisfactory results. In this book not only mathematical abstractions are discussed in a lucid manner, with physical mathematical and geometrical explanations, but also several practical applications are given particularly for system identification, description and then efficient controls. The normal physical laws like, transport theory, electrodynamics, equation of motions, elasticity, viscosity, and several others of are based on 'ordinary' calculus. In this book these physical laws are generalized in fractional calculus contexts; taking, heterogeneity effect in transport background, the space having traps or islands, irregular distribution of charges, non-ideal spring with mass connected to a pointless-mass ball, material behaving with viscous as well as elastic properties, system relaxation with and without memory, physics of random delay in computer network; and several others; mapping the reality of nature closely. The concept of fractional and complex order differentiation and integration are elaborated mathematically, physically and geometrically with examples. The practical utility of local fractional differentiation for enhancing the character of singularity at phase transition or characterizing the irregularity measure of response function is deliberated. Practical results of viscoelastic experiments, fractional order controls experiments, design of fractional controller and practical circuit synthesis for fractional order elements are elaborated in this book. The book also maps theory of classical integer order differential equations to fractional calculus contexts, and deals in

details with conflicting and demanding initialization issues, required in classical techniques. The book presents a modern approach to solve the 'solvable' system of fractional and other differential equations, linear, non-linear; without perturbation or transformations, but by applying physical principle of action-and-opposite-reaction, giving 'approximately exact' series solutions. Historically, Sir Isaac Newton and Gottfried Wihelm Leibniz independently discovered calculus in the middle of the 17th century. In recognition to this remarkable discovery, J.von Neumann remarked, "...the calculus was the first achievement of modern mathematics and it is difficult to overestimate its importance. I think it defines more equivocally than anything else the inception of modern mathematical analysis which is logical development, still constitute the greatest technical advance in exact thinking." This XXI century has thus started to 'think-exactly' for advancement in science & technology by growing application of fractional calculus, and this century has started speaking the language which nature understands the best.