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Fractional Calculus and Its Applications in Physics, an Editorial

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EDITORIAL

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EDITORIAL

The dynamics of complex real-world issues are intimately linked to fractional calculus. Fractional operators are non-local and can better and more thoroughly describe a variety of natural events. Fractional order differential equations accurately rule many mathematical models. The conclusions for the fractional mathematical model are more wide and accurate since classical mathematical models are special examples of fractional order mathematical models.

Engineers, mathematicians, scientists, and researchers working with real-life phenomena can benefit greatly from fractional derivatives and integrals. As a result, this Research Topic Ebook includes some recent works that demonstrate the range and depth of ongoing research in the field of fractional calculus and its applications in physics. It includes nine pieces written by 40 authors from around the world.

A proposes a user-friendly method for obtaining analytical solutions to the fractional order Newell–Whitehead–Segel equations using the theory of Adomian decomposition.In two-dimensional (2-D) systems, the fractional Newell–Whitehead–Segel equation is used to interpret the creation of stripe patterns.

The illustrate the Laguerre differential equation as a fractional extension The conformable derivative of order 0 1 was employed by the authors. The authors demonstrate that the numerical values obtained using the proposed scheme are extremely precise. The conformable derivative of order 0 1 was employed by the authors. To derive two linearly independent solutions to the problem, the authors used the Frobenius scheme in conjunction with the fractional power series expansion. The fractional Laguerre functions are derived in closed forms, and their orthogonality results are established.

How the Hilfer–Prabhakar fractional operator and the Laplace operator of fractional order relate to the computable solution of the arbitrary order advection-dispersion problem. Similar to the Hilfer–Prabhakar fractional operator, as well as the fractional order Laplace operator. The method for reaching the solution is a hybrid approach that employs Sumudu and Fourier transformations. The authors derive the solution in the form of the generalised Mittag–Leffler function, which is compatible with numerical evaluation of the results.

Prony series decomposition is used to demonstrate both the theory and formulation of linear viscoelastic response functions, as well as their reasonable link with the Caputo–Fabrizio (CF) fractional operator (PSD). The author examines the topic of interconversion using power and exponential laws, with a focus on the PSD approach, connected interconversion problems, and the presentation of viscoelastic constitutive equations in the form of arbitrary order CF operators.

The propose a mathematical notion for a dynamical decision-making model and renewal events, and subordinate the individual's character to the network's mean field nature. The authors demonstrated that using the theory of subordination as a tempered fractional differential equation, the individual dynamics may be obtained. The authors computed the numerical results after reporting the exact solution of a fractional differential equation in the form of a Mittag–Leffler function.