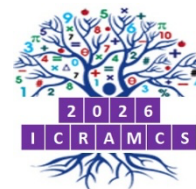


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The \emptyset -Caputo Fractional Derivative in KdV Systems: Enhancing Prediction and Modeling Accuracy

Communication Info

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Abstract

This work is devoted to an investigation of the properties of the KdV system in terms of the \emptyset -Caputo fractional derivative, which is an effective generalization taking into account memory effect and nonlocal features of many physical systems. Such fractional modeling is able to provide a more accurate description of nonlinear wave than the traditional integer order partial differential equations. The Residual Power Series Method (RPSM), which is quick convergent and systematic, is used to obtain the approximate analytical solutions. Moreover, the New Iterative Method (NIM) is applied to improve the solution procedure and guarantee the results. The synthetic use of RPSM and NIM gives us a very efficient, accurate and robust structure to find solutions for diffuse complex fractional order systems. Numerical simulations verify the effectiveness and applicability of the new methods based on the influence of fractional parameters to wave motions. The results show that the \emptyset -Caputo derivative has the potential to improve modeling prediction and having the capability to provide fractional differential equations in a variety of scientific domains.

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References

- [1] Korteweg, D.J. and De Vries, G. On the change of form of long waves advancing in a rectangular canal, and on a new type of long stationary waves. The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science, 39(240), (1895).422-443.
- [2] Ablowitz, M.J. and Segur, H. Solitons and the inverse scattering transform. Society for Industrial and Applied Mathematics. (1981)
- [3] Dodd, R.K., Eilbeck, J.C., Gibbon, J.D. and Morris, H.C. Solitons and nonlinear wave equations. (1982)
- [4] Jumarie, G., Modified Riemann-Liouville derivative and fractional Taylor series of nondifferentiable functions further results. Computers and Mathematics with Applications, 51(9-10), (2006), 1367- 1376.
- [5] bdeljawad, T., On conformable fractional calculus. Journal of computational and Applied Mathematics, 279, (2015), 57-66.