An effective method in modeling the new soliton solutions for nonlinear Radhakrishnan-Kundu-Lakshmanan equation

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Received: 19 April 2019 Accepted: 12 February 2020

Extended Abstract

Paper pages (781-800)

Introduction

In this paper, we consider a generalized form of nonlinear Radhakrishnan-Kundu-Lakshmanan equation. The generalized exponential rational function method (GERFM) has been used to obtain some novel exact optical solutions. Several numerical simulations are provided to show the behavior of the exact results. The solutions might be very useful in their corresponding models. It is apparent that the employed method is easy to use but quite efficient for the extraction of solutions of the problem. Moreover, it is applicable for solving other nonlinear problems arising in mathematics, physics and other branches of engineering. All computations and numerical simulations are carried out with Mathematica software.

Material and methods

In this paper GERFM has been applied directly to solve a partial differential. To this end, it is necessary first to convert the given form of the equation from a partial differential equation to an ordinary differential equation. This transformation is done by considering a new appropriate variable change. Our most important assumption in this method is to assume the form of the equation's solution in a general symbolically form. This general form contains several unknown constants, which are determined by placing in the original equation. To determine these unknowns, we need to solve a nonlinear device that is usually performed using symbolic packages. The method requires no linearization, discretization, or perturbation.

Results and discussion

In this paper GERFM has been applied directly to solve a PDE without requiring linearization, discretization, or perturbation. The obtained results demonstrate the reliability of the algorithm and give it a wider applicability to nonlinear differential equations. The graphical representations clearly indicate the solitary wave solutions exhibit many different types of the solitons. The method is also capable of coping with the wide family of nonlinear physical problems. More briefly, the method allows us more solution sets, less computational work and less computer memory while using a computer software.

Conclusion

The main purpose of this paper is to present new numerical and numerical solutions to a nonlinear partial differential equation. The analytical method used in the paper is generalized fractional exponential functions method. The correctness of all the exact solutions presented are evaluated using the Symmetric Symmetric Software. And it was found that they all satisfy in the original equation. The soliton solutions obtained have different structures such as trigonometric, hyperbolic, and exponential functions; this indicates the robustness and efficiency of the method. The significance of the results of this study is to provide new sets of exact solutions to this equation. The methods used can also be used to solve other partial differential equations in mathematics, physics, and nonlinear engineering.

Keywords: PDEs, The nonlinear Radhakrishnan-Kundu-Lakshmanan equation, Generalized exponential rational function method, Symbolic computations, Soliton wave solutions.

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