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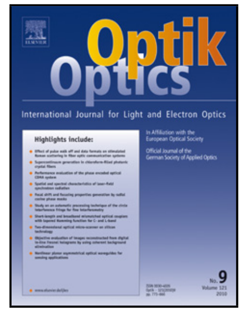

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Fractional version of (1+1)-dimensional Biswas-Milovic equation and its solutions

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Abstract
This work deals with fractional version of (1+1)-dimensional Biswas-Milovic equation that describes the long-distance optical communications. Some soliton and traveling wave solutions are obtained for the equation by means of four trigonometric analytical methods and symbolic computations. The solution of the problem by means of these methods reduces the independent variables in the fractional equation by one leading to nonlinear ordinary differential equations. The resulting nonlinear ordinary differential equations are then solved analytically using Maple software. All of obtained solutions are new for the fractional Biswas-Milovic equation. The work shows the power of these schemes and the variety of the obtained solutions.

Keywords: Biswas-Milovic equation; fractional order derivative; exact solution; sec-csc method; sech-csch method; tan-cot method; tanh-coth method

1 Introduction

Fractional differentiation has been found to be effective to describe many phenomena in chemistry, fluid flow, biology, acoustics, finance, control theory, psychology and another areas of science and engineering. That is because of the fact that a reasonable modelling of a physical phenomenon have dependence not only of the time instant but also on the prior time history which can be fruitfully achieved by using fractional calculus. This returns to the nonlocal property of fractional derivatives. Therefore, fractional differential equations (FDEs) are powerful tools to describe real world problems more accurately than the integer-order differential equations. Many real world problems are modeled by FDEs, and finding the solution of these equations have been the subject of many investigation in recent years. In the last two decades, there have been a number of methods devoted to the solution of FDEs. These schemes can be classified into two categories, numerical and analytical. The differential transform method [1], the enhanced Homotopy perturbation method [2], the new Homotopy perturbation method [3], the modified Homotopy perturbation method [4], the variational iteration method [5], the Adomian decomposition method [6], the Homotopy analysis method [7], Adams-Baskforth-Moultun method [8], and Haar wavelet operational matrix method [9], have been used to solve FDEs, numerically. However applications of some of these methods have limitations and disadvantages. For example, Adomian decomposition method has a complicated algorithm in computation of Adomian polynomials for nonlinear equations. In each iteration of Homotopy perturbation method, one must solve a nonlinear functional equation which sometimes is not easy.