Research Article

Applications of the New Compound Riccati Equations Rational Expansion Method and Fan's Subequation Method for the Davey-Stewartson Equations

Hassan Zedan[1, 2]

[1] *Mathematics Department, Faculty of Science, Kafr El-Sheikh University, Kafr El-Sheikh 33516, Egypt*
[2] *Mathematics Department, Faculty of Science, King Abdul Aziz University, P.O. Box 80203,*
  Jeddah 21589, Saudi Arabia

Correspondence should be addressed to Hassan Zedan, hassanzedan2003@yahoo.com

We used what we called extended Fan's sub-equation method and a new compound Riccati equations rational expansion method to construct the exact travelling wave solutions of the Davey-Stewartson (DS) equations. The basic idea of the proposed extended Fan's subequation method is to take fulls advantage of the general elliptic equations, involving five parameters, which have many new solutions and whose degeneracies lead to special subequations involving three parameters like Riccati equation, first-kind elliptic equation, auxiliary ordinary equation and generalized Riccati equation. Many new exact solutions of the Davey-Stewartson (DS) equations including more general soliton solutions, triangular solutions, and double-periodic solutions are constructed by symbolic computation.

1. Introduction

The investigation of the exact travelling wave solutions for nonlinear partial differential equations plays an important role in the study of nonlinear physical phenomena. These exact solutions when they exist can help the physicists to well understand the mechanism of the complicated physical phenomena and dynamically processes modeled by these NLPDEs. In recent years, large amounts of effort have been directed towards finding exact solutions. Many powerful method have been proposed, such as Darboux transformation [1], Hirota bilinear method [2], Lie group method [3], homogeneous balance method [4], tanh method. In this paper, we construct the exact travelling wave solutions for the Davey-Stewartson (DS)