



(G'/G) -Expansion Method and Weierstrass Elliptic Function Method Applied to Coupled Wave Equation

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Abstract: This paper deals with the exact solutions of a nonlinear coupled wave equation. The (G'/G) -expansion method has been applied to derive kink solutions and singular wave solutions. The restrictions on the coefficients of the governing equations have also been investigated. Solitary wave solutions have also been derived for this system of equations using the Weierstrass elliptic function method.

Keywords: (G'/G) -expansion method; coupled wave equation; kink wave solutions; singular wave solutions; solitary wave solutions; Jacobi and Weierstrass elliptic functions.

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1 Introduction

Nonlinear evolution equations (NLEEs) govern several physical phenomena which appear in various branches of science and engineering [1–5]. Exact solutions of NLEEs shed more light on the various aspects of the problem, which, in turn, leads to the applications. Several methods such as the tanh method [6–11], exponential function method [12], Jacobi elliptic function (JEF) method [13–16], mapping methods [17–22], Hirota bilinear method [23, 24] and trigonometric-hyperbolic function methods [25–27] have been applied in the last few decades and the results have been reported. Also, many physical phenomena have been governed by systems of partial differential equations (PDEs) and there have been significant contributions in this area [28, 29].

In this paper, we use the (G'/G) -expansion method [30–34] to find some exact solutions for a nonlinear coupled wave equation [35]. The paper is organized as follows. In Section 2, we give a mathematical analysis of the (G'/G) -expansion method, in Section 3, we find kink solutions and singular wave solutions of the nonlinear coupled wave equation, in Section 4, we use the Weierstrass elliptic function (WEF) method [36] to derive SWSs of the system of equations, in Section 5 we write down the conclusion.

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