



A Variety of New Solitary-Solutions for the Two-mode Modified Korteweg-de Vries Equation

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Abstract: In this paper, we studied the nonlinear two-mode modified Korteweg-de Vries (TMmKdV) equation. We derived multiple singular soliton solutions to this new version of KdV equation by using the simplified form of Hirota's direct method. Also, kink and periodic solutions are extracted by using the tanh-expansion and the sine-cosine function methods. Finally, graphical analysis is conducted to show some physical features regarding TMmKdV equation.

Keywords: two-mode mKdV; Hirota bilinear method; sine-cosine function method; multiple singular solutions; kink and periodic solutions.

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1 Introduction

Sergei V. Korsunsky [1] was the first who established the nonlinear two-mode Korteweg-de Vries (TMKdV) equation which reads

$$w_{tt} + (a_1 + a_2)w_{xt} + a_1a_2w_{xx} + ((\lambda_1 + \lambda_2)\frac{\partial}{\partial t} + (\lambda_1a_2 + \lambda_2a_1)\frac{\partial}{\partial x})ww_x \quad (1) \\ + ((\mu_1 + \mu_2)\frac{\partial}{\partial t} + (\mu_1a_2 + \mu_2a_1)\frac{\partial}{\partial x})w_{xxx},$$

where $w(x, t)$ is a field function representing the height of the free water surface above a flat bottom, a_1 and a_2 are the phase velocities, μ_1 and μ_2 are the dispersion parameters,

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