



Solitary Wave Solutions of the Phi-Four Equation and the Breaking Soliton System by Means of Jacobi Elliptic Sine-Cosine Expansion Method

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Abstract: The goal of this study is twofold. The Jacobi elliptic expansion method is used to extract new solutions for the phi-four equation and the breaking soliton system. Special values of the Jacobi elliptic module and other involved parameters are chosen to produce solutions of soliton type and singular periodic solutions. The obtained solutions are verified and presented graphically.

Keywords: *Jacobi elliptic sine-cosine expansion method; phi-four equation; breaking soliton system.*

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1 Introduction

Solitary waves occur due to nonlinear phenomena appearing in different fields of science and engineering. These nonlinear phenomena are interpreted as $(n + 1)$ -dimensional nonlinear partial differential equations. Seeking the exact solutions to these equations provides essential information about the physical structure of such phenomena. Since there is no specific method that produces such solutions, researchers made all the efforts to construct and modify methods to retrieve different kind of solutions for the same nonlinear model. We may mention some of these well-known techniques such as: the simplified bilinear method [11, 18, 31], sine-cosine method [4, 5], rational trigonometric function method [6], tanh method [7], extended tanh method [12, 27], Yan transformation

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