
Application of Extended Prolle-Singer Method for the Second-Order Ordinary Differential Equations

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Abstract

In this work, we investigate how to obtain the general solutions of a nonlinear differential equations by using Prolle-Singer method. Then we consider Mathews-Lakshmanan oscillator equation, which possesses exact periodic solution. It has interesting features, namely the nonlinearity of the potential and the presence of a term that can be interpreted as a position-dependent mass. We obtain the time-independent integral of this equation by using Prolle-Singer method, the equation is integrable by these first integrals and we can find solution by using these first integrals. Further, the knowledge of λ -symmetry and integrating factor can be obtained by using functions S and R which are related to λ -symmetry and integrating factor, respectively. And the Lagrangian, the Hamiltonian and conjugate momentum functions can be identified. Then we interpret these results by drawing the graphics via phase portrait methods.

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