Numerical Simulation of Emden-Fowler Type Equations Using Variational Iteration Algorithm

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The main objective of this article is to present a reliable algorithm to determine exact and approximate solutions of the generalized Emden-Fowler type equations. The algorithm mainly is based on He's variational iteration method (VIM) with an alternative framework designed to overcome the difficulty of the regular singular point at $x = 0$. In this method, general Lagrange multipliers are introduced to construct a correction for the problem. The multipliers in the functional can be identified optimally via the variational theory. The results reveal that the proposed method is very effective and can be applied for other nonlinear problems.

Key words: Emden-Fowler Equation; Variational Iteration Method; Lagrange Multipliers; Correction Functional; Frobenius Method; Singular Point.