

An efficient semi-analytical method by using adaptive approach in Solving nonlinear schrödinger equations

ABSTRACT

This paper introduces a novel method called the Adaptive Hybrid Reduced Differential Transform Method (AHRDTM) to solve Nonlinear Schrödinger Equations (NLSEs). This method provides semi-analytical solutions over a longer time frame. It achieves this by producing sub-division intervals of varying lengths, distinguishing it from the classical Multistep Reduced Differential Transform Method (MsRDTM). Importantly, the AHRDTM eliminates the necessity for perturbation, linearization, or discretization, providing the benefits of adaptability and reliability. The outcomes exhibit that AHRDTM yields highly efficient solutions for NLSEs. Moreover, the method is simple, significantly reducing the computational workload in solving NLSE problems, and shows promising opportunity for application in diverse complex partial differential equations (PDEs). The efficiency and effectiveness of AHRDTM are demonstrated through tables and graphical representations.