



# Improved Runge-Kutta Method with Trigonometrically-Fitting Technique for Solving Oscillatory Problem

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## Abstract

In this article we propose a new method of Trigonometrically-Fitted Improved Runge-Kutta (TFIRK3(3)) with third-order and three stages for solving oscillatory ordinary differential equations. The proposed algorithm employs a derivation of method by adding trigonometric into the Improved Runge-Kutta (IRK3(3)) method. It is found that the new method is more accurate as compared to IRK3(3) and classical Runge-Kutta methods. To illustrate the efficiency of this method, number of initial value problem for the system of first-order ordinary differential equations (ODEs) are solved. The computational experiments show that the TFIRK3(3) method performs better than RK3(3), RK4(4), IRK3(3) and PHSFRK5(4) methods in most cases.

**Keywords:** Trigonometrically-fitted; ordinary differential equations; improved Runge-Kutta method; quantum cryptography; differential equations foundations; Schrödinger equations; computational experiments.