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# SERIES SOLUTION OF ORDINARY DIFFERENTIAL EQUATION USING A MODIFIED VERSION OF THE ADOMIAN DECOMPOSITION METHOD

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**Abstract:** We present a new modified version of the Adomian decomposition method for computing the series solutions of the nonlinear ordinary differential equations (ODEs). The recently proposed Adomian matrix algorithm is used in this method to compute the Adomian polynomials for scalar-valued nonlinear polynomial functions, which allows us to get the series solution of the ODEs numerically and makes it much faster than symbolic computation. This method can test the convergence of the series solution of the ODE by calculating the global squared residual error of the solution. Several types of nonlinear ODEs, such as Abel equation, De Boer-Ludford equation, Van der Pol equation, Painleve-Ince equation, and Falkner-Skan equation, are solved using this method to illustrate its performance and effectiveness in delivering solutions.

**Keywords and Phrases:** ODE, series solution, convergence, Adomian polynomials.

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## 1. Introduction

Nonlinear differential equations are effective modeling tools for nonlinear dynamical events in a variety of disciplines, including mathematical biology, nonlinear optics, plasma physics, nano physics, solid-state physics, and fluid dynamics. Finding exact solutions to nonlinear differential equations can be accomplished using