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SOLVING ORDINARY DIFFERENTIAL EQUATION USING FIFTH-ORDER MEAN RUNGE-KUTTA METHODS

(Penyelesaian Persamaan Pembezaan Biasa Menggunakan
Kaedah Runge-Kutta Min Peringkat Kelima**)**

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ABSTRACT

This study is focused on constructing new fifth-order Runge-Kutta methods to solve ordinary differential equations. Existing classical third and fourth-order Runge-Kutta methods are utilized as the bases to obtain new fifth-order method by modification in stages using arithmetic mean. Computation to yield each parameter is needed and the results of the calculation produce new formula. These new methods are tested on ordinary differential equations and the results are compared with the analytical solution. Numerical solutions for the fifth-order Runge-Kutta methods are shown in terms of absolute error in order to compare the results. Mathematica 4.2 software has been used to determine the coefficients and to solve the ordinary differential equations.

Keywords: Runge-Kutta Method; New Runge-Kutta Fifth-Order Method; Arithmetic Mean

ABSTRAK

Kajian ini dijalankan bagi menghasilkan kaedah Runge-Kutta peringkat-5 terubah suai bagi menyelesaikan persamaan pembezaan biasa. Kaedah Runge-Kutta peringkat-3 dan -4 klasik diubah suai bagi menghasilkan kaedah Runge-Kutta peringkat-5 dengan menggunakan min aritmetik. Pekali-pekali baru diperoleh untuk setiap satu kaedah Runge-Kutta peringkat-5 yang diubah suai. Semua kaedah Runge-Kutta yang terhasil diuji kejituannya pada persamaan pembezaan biasa dan hasilnya dibandingkan secara beranalisis. Penyelesaian berangka bagi semua kaedah Runge-Kutta terubah suai diperlihat dalam bentuk ralat mutlak. Perisian Mathematica 4.2 digunakan bagi mendapatkan pekali-pekali dan penyelesaian persamaan pembezaan biasa yang diuji.

Kata kunci: Kaedah Runge-Kutta; Kaedah Runge-Kutta Peringkat Kelima; Min Aritmetik

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