UNIVERSITI TEKNOLOGI MARA

NUMERICAL STUDY OF RUNGE-KUTTA METHOD IN SOLVING NONLINEAR DIFFERENTIAL EQUATIONS (P30S23)

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ABSTRACT

Nonlinear differential equations are differential equations that involve nonlinear terms, which is when the dependent variables and their derivatives are not in the first degree or there is an exponential function and trigonometry function exist in those differential equations. Meanwhile, a Runge-Kutta method is a numerical method that is used to solve ordinary differential equations and involves an iterative process to produce an approximation solution. Although there are many numerical methods to solve nonlinear differential equations, those methods will only produce approximation solutions. Hence, the purpose of this study is to determine the effectiveness of the Runge-Kutta method in solving nonlinear differential equations by calculating the absolute error of the method. This study will apply the Runge-Kutta method to find the numerical solution for a few examples of nonlinear differential equations. Those numerical solutions will be used to compare with the exact solution of each example. For each example, we will use two step sizes, $h = 0.0001$ and $h = 0.1$ to determine which step size has better accuracy for each example. The accuracy of the Runge-Kutta method will be analyzed by calculating the absolute error and plotting a curve-fitting graph. The results obtained from this study showed that Runge-Kutta method is more effective in solving nonlinear differential equations when using a smaller step size.

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