

On the convergence and stability analysis of a modified Kutta's algorithm

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Here we present the stability analysis of a modified Kutta's algorithm derived from a tactful application of a geometric progression. By a careful use of a binomial expansion for rational powers and the use of geometric mean we constructed a new formula from the traditional Kutta formula, a one-step explicit method for the solution of initial value problems in ordinary differential equations. This formula has been derived and implemented in Agbeboh and Ehiemua (2012) and its results found to compare favourably well with other existing Runge-Kutta Formulae (RKF) on the solutions of initial value problems (IVPs) in ordinary differential equations (ODEs). The main focus here is to establish the Region of Absolute Stability (RAS) by means of a binomial process capable of producing a polynomial function that can be solved by MATLAB package. By solving this polynomial function in equation (4.24), we discovered that it has complex eigenvalues which lie completely on the left hand side of the complex plane, which shows that the Algorithm is stable. In addition, we also proved that the algorithm converges within the given region of absolute stability using the same polynomial.

2010 Mathematics Subject Classification: 65L20, 65L06.