A NEW SEVENTH ORDER RUNGE-KUTTA FAMILY

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Abstract

In this article, a new family of Runge-Kutta methods of order 7 for solving ordinary differential equations is discovered and depends on the parameter b_8 and . For $b_8 = 77/1440$, we find the Butcher method [J. C. Butcher, Numericals Methods for Ordinary Differential Equations, Second Edition, 2008]. We show that the stability region does not depend on b_8. Using a numerical example and Java programming, a study on the coefficient b_8 is also presented to determine the best method in relation to that of Butcher [J. C. Butcher, Numericals Methods for Ordinary Differential Equations, Second Edition, 2008]. Finally, software in Java programming is presented to determine an approximate value of the ordinary differential equation.