

A three-stage explicit two-step Runge-Kutta-Nyström method for solving second-order ordinary differential equations

ABSTRACT

A three-stage explicit two-step Runge-Kutta-Nyström (TSRKN) method is developed for the numerical integration of special second-order ordinary differential equations. Algebraic order conditions of the method are obtained and fourth-order method is derived. The second-order initial value problems of ordinary differential equations (ODEs) are solved directly using TSRKN and Runge-Kutta-Nyström (RKN) methods. The problems were then reduced to first-order system when solved by Runge-Kutta (RK) method. Numerical comparison of this new method with the existing RK and RKN methods of the same order using constant step size are carried out to illustrate its efficiency and it shows that the new method has clear advantage in terms of function evaluation.

Keyword: Constant step size; Order conditions; Second-order ordinary differential equations; Two-step Runge-Kutta-Nyström method