

One dimensional nonlinear integral operator with Newton–Kantorovich method

ABSTRACT

The Newton–Kantorovich method (NKM) is widely used to find approximate solutions for nonlinear problems that occur in many fields of applied mathematics. This method linearizes the problems and then attempts to solve the linear problems by generating a sequence of functions. In this study, we have applied NKM to Volterra-type nonlinear integral equations then the method of Nystrom type Gauss–Legendre quadrature formula (QF) was used to find the approximate solution of a linear Fredholm integral equation. New concept of determining the solution based on subcollocation points is proposed. The existence and uniqueness of the approximated method are proven. In addition, the convergence rate is established in Banach space. Finally illustrative examples are provided to validate the accuracy of the presented method.

Keyword: Newton–Kantorovich method; Nonlinear operator; Volterra integral equation; Gauss–Legendre quadrature formula