Quadrature formula for approximating the singular integral of Cauchy type with unbounded weight function on the edges.

ABSTRACT

New quadrature formulas (QFs) for evaluating the singular integral (SI) of Cauchy type with unbounded weight function on the edges is constructed. The construction of the QFs is based on the modification of discrete vortices method (MMDV) and linear spline interpolation over the finite interval $[-1,1]$. It is proved that the constructed QFs converge for any singular point x not coinciding with the end points of the interval $[-1,1]$. Numerical results are given to validate the accuracy of the QFs. The error bounds are found to be of order $O(h\alpha|\ln h|)$ and $O(h|\ln h|)$ in the classes of functions $H\alpha([-1,1])$ and $C1([-1,1])$, respectively.

Keyword: Singular integral; Quadrature formula; Discrete vortices method; Spline approximation; Modification