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Quadrature rules with multiple nodes for evaluating integrals with strong singularities

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Abstract

We present a method based on the use of Chakalov-Popoviciu quadrature formula of Lobatto type, a rather general case of quadrature with multiple nodes, for approximating integrals defined by Cauchy principal values, or by Hadamard finite parts. As the starting point we use the results obtained by L. Gori and E. Santi [1,2]. We generalize their results by using some our numerical procedures for stable calculating of the quadrature formula with multiple nodes of gaussian type and proposed methods for estimating of the remainder term in such type quadrature formula. Numerical examples, illustrations and comparisons are shown.

Key words: Quadratures with multiple nodes; σ-orthogonal polynomials; Finite part integral in sense of Hadamard; Cauchy principle value; Remainder term for analytic functions; Contour integral representation; Error estimate

AMS classification: Primary 41A55; Secondary 65D30, 65D32

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