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Interpolatory quadrature formulas for meromorphic integrands[†]

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Abstract

Let $\mathcal{I}_W(f) = \int_a^b f(x)W(x)dx$, where the integrand f is analytic on $[a,b]$ and probably meromorphic on an open set $V \supset [a,b]$. A variety of Gauss quadrature formulas based on rational functions, have been intensively applied in the last thirty years to evaluate $\mathcal{I}_W(f)$. One of the drawbacks of these procedures is that to become efficient, coefficients and nodes must depend on the poles of f. Monegato [8] presented a less costly approach based on interpolatory rules whose nodes are those common to a couple of simultaneous quadrature formulas of polynomial type. In this paper we examine a variant of Monegato's method, to estimate $\mathcal{I}_W(f)$ by means of procedures which are not of Gauss type. Our approach is mainly based upon the rational modification BW/A, which is superior to W/A, when some zeros of f lie near $[a,b]$.

Keywords: Quadrature formulas of interpolatory type, ill-scaled integrands, smoothing transformation, difficult poles, difficult zeros, meromorphic integrands.

MSC: Primary 41A55; Secondary 41A25, 42B35.

§1. Introduction

Most forms of addressing the problem of integrating functions poorly scaled are related to one of the following strategies: $\mathbf{S_1}$) *find a suitable modification of the integrand and*

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