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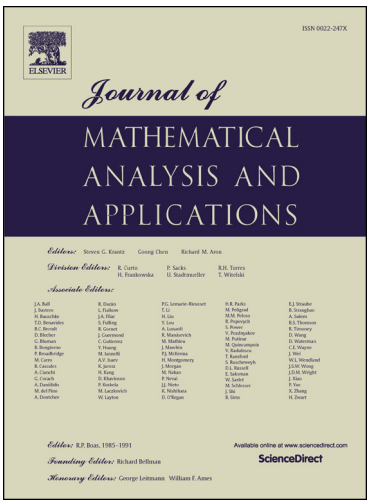

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An Upper Bound Estimate and Stability for the Global Error of Numerical Integration Using Double Exponential Transformation

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Abstract

The double exponential formula was introduced for calculating definite integrals with singular point oscillation functions and Fourier integral. The double exponential transformation is not only useful for numerical computations but it is also used in different methods of Sinc theory. In this paper we give an upper bound estimate for the error of double exponential transformation. By improving integral estimates having singular final points, in Theorem 1 we prove that the method is convergent and the rate of convergence is $\mathcal{O}(h^2)$ where h is a step size. Our main tool in the proof is DE formula in Sinc theory. The advantage of our method is that the time and space complexity is drastically reduced. Furthermore, we discovered an upper bound error in DE formula independent of N-truncated number, as a matter of fact, we proved stability. Numerical tests are presented to verify the theoretical predictions and confirm the convergence of the numerical solution.
MSC: 65D30, 65D32.
Keyword: numerical integral, double exponential transformation, Sinc theory, quadrature formula.

1 Introduction

The double exponential transformations (DE) is used for evaluation of integrals of an analytic function has end point singularity. Our innovation

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