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New quadrature formulas based on the zeros of the Chebyshev polynomials of the second kind. (English) Zbl 1073.65021

Quadrature formulas are derived for integrals
\[ \int_{-1}^{1} f(x)w(x) \, dx, \quad w(x) = (1 - x^2)^{1/2}, \text{ or } w(x) = (1 - x^2)^{-1/2} \]
which are accurate for polynomials of respective degree \(2(s+1)n + 2s - 1\), \(2(s+1)n + 2s + 1\), \(s, n \in \mathbb{N}\). The formulas employ divided differences at the zeros of \((1 - x^2)Q_n(x)\) where \(Q_n(x)\) is an \(n\)-th degree Chebyshev polynomial of the second kind. When \(s = 0\) and \(n\) is replaced by \(2n - 1\) the second formula reduces to a formula given by A. K. Varma and E. Landau [ibid. 30, No. 3-6, 213–220 (1995; Zbl 0833.41027)] exact for polynomials of degree \(4n - 1\). The formulas are related to the Gauss-Turan quadrature formula.

Reviewer: J. B. Butler jun. (Portland)

MSC:
- 65D32 Numerical quadrature and cubature formulas
- 41A55 Approximate quadratures

Keywords:
Quadrature formulas; Chebyshev polynomials; Divided differences

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References:

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