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Quadrature formula of the highest algebraic degree of accuracy containing predefined nods.
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Summary: Approximate methods for calculating definite integrals are relevant to this day. Among them, the quadrature methods are the most popular as they enable one to calculate approximately the integral using a finite number of values of the integrable function. In addition, in many cases, less computational labor is required compared to other methods. Using Chebyshev polynomials of the first, second, third, and fourth kind corresponding to the weight functions $p(x) = \frac{1}{\sqrt{1-x^2}}$, $p(x) = \sqrt{1-x^2}$, $p(x) = \sqrt{1+x(1-x)}$, and $p(x) = \sqrt{1-x(1+x)}$, on the segment $[-1,1]$, quadrature formulas are constructed with predefined nodes $a_1 = -1$, $a_2 = 1$, and estimates of the remainder terms with degrees of accuracy $2n+1$. In this case, a special place is occupied by the construction of orthogonal polynomials with respect to the weight $p(x)(x^2 - 1)$ and finding their roots. This problem turned out to be laborious and was solved by methods of computational mathematics.

MSC:
65R10 Numerical methods for integral transforms
65R20 Numerical methods for integral equations

Keywords:
weight functions; orthogonal polynomials; quadrature formulas; predetermined nodes; remainder terms; degrees of accuracy

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References:

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