

An Optimal Quadrature Formulas for Numerical Integration of Riemann-Liouville Fractional Integral

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In the present article, the problem of construction of the optimal quadrature formula is discussed for numerical integration of the right Riemann-Liouville integral in the Hilbert space $W_2^{(m,m-1)}[t, 1]$ of real-valued functions. Initially, the norm of the error functional is found using the extremal function of the error functional of the quadrature formula. Since the error functional is defined on the Hilbert space, the quadrature formula that we are constructing is exact for zeros of this space, that is, we have the conditions that the influence of the error functional on these functions is equal to zero. Then, the Lagrange function is constructed to find the conditional extremum of the error functional. Thereby, a system of linear equations is obtained for the coefficients of the optimal quadrature formula. The existence and uniqueness of the solution of the obtained system are studied. This system of linear equations is solved by the Sobolev method. And the analytical form of the coefficients is obtained.