Orthogonality on the Semicircle and Applications: Old and New Results

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Abstract

One nonstandard type of orthogonality – orthogonality on the semicircle – was introduced and studied by Gautschi and Milovanović [2], and later generalized in [3] and [5]. Applications in numerical differentiation were given in [4] and [1]. Beside this background, starting from recent results given in [6], in this lecture we present new results on orthogonal Laurent polynomials on the semicircle, their properties, as well as some new applications in numerical integration and numerical differentiation.

Keywords: Complex orthogonal systems, Recurrence relations, Quadrature formula, Numerical differentiation, Zeros

References

1. Calio', F., Frontini, M., Milovanović, G.V.: Numerical differentiation of analityc functions using quadratures on the semicircle, Comput. Math. Appl. 22 (1991) 99–106.
2. W. Gautschi, W., Milovanović, G.V.: Polynomials orthogonal on the semicircle, J. Approx. Theory 46 (1986) 230–250.
3. W. Gautschi, W., Landau, H.J., Milovanović, G.V.: Polynomials orthogonal on the semicircle. II, Constr. Approx. 3 (1987) 389–404.
4. Milovanović, G.V.: Some applications of the polynomials orthogonal on the semicircle, In: Numerical Methods (Miskolc, 1986), pp. 625–634, Colloquia Mathematica Societatis Janos Bolyai, Vol. 50, North-Holland, Amsterdam – New York, 1987.
5. Milovanović, G.V.: Complex orthogonality on the semicircle with respect to Gegenbauer weight: theory and applications, In: Topics in Mathematical Analysis (Th. M. Rassias, ed.), pp. 695–722, Ser. Pure Math., 11, World Sci. Publ., Teaneck, NJ, 1989.
6. Milovanović, G.V.: Special cases of orthogonal polynomials on the semicircle and applications in numerical analysis, Bull. Cl. Sci. Math. Nat. Sci. Math. 44 (2019) 1–28.