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COMPLEMENTARY ROMANOVSKI-ROUTH POLYNOMIALS: FROM ORTHOGONAL POLYNOMIALS ON THE UNIT CIRCLE TO COULOMB WAVE FUNCTIONS

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Abstract

We consider properties and applications of a sequence of polynomials known as complementary Romanovski-Routh polynomials (CRR polynomials for short). These polynomials, which follows from the Romanovski-Routh polynomials or complexified Jacobi polynomials, are known to be useful objects in the studies of the one-dimensional Schrödinger equation and also the wave functions of quarks. We show how the CRR-polynomials are related to a special class of orthogonal polynomials on the unit circle. Also we establish their connection to a class of functions which are related to a subfamily of Whittaker functions that includes those associated with the Bessel functions and the regular Coulomb wave functions. Behavior of the zeros of this subfamily of Whittaker functions are also studied.

Keywords: Romanovski-Routh polynomials, Second order differential equations, Orthogonal polynomials on the unit circle, Para-orthogonal polynomials.

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