Strong asymptotics for relativistic Hermite polynomials

Wolfgang Gawronski (University of Trier, Germany)

Recent investigations of the harmonic oscillator in the frame of relativistic quantum theory lead to a wave equation the solution of which "essentially" is given by the relativistic Hermite polynomials $H_n^N$. Here $N$ denotes a positive parameter describing the relativistic effect such that the system approaches the classical (nonrelativistic) model as $N \to \infty$. This transition is made precise by the limiting relation

$$\lim_{N \to \infty} H_n^N(x) = H_n(x)$$

where $H_n$ denotes the well known Hermite polynomials.

Most recent contributions are concerned with weak asymptotics that is the asymptotic zero distribution for the relativistic Hermite polynomials $H_n^N$. Extending and supplementing these results here we consider strong asymptotics for the rescaled polynomials $H_n^N(c_n x)$ ($c_n > 0$ suitably, $n, N \to \infty$) that is Plancherel-Rotach asymptotics. The proofs largely are based on corresponding results for Jacobi polynomials with varying weights.