AIP | Journal of Mathematical Physics

The relativistic Hermite polynomial is a Gegenbauer polynomial

By **Bengt Nagel**[1]

J. Math. Phys. 35, 1549 (1994); **http://dx.doi.org/10.1063/1.530606**

Abstract

It is shown that the polynomials introduced recently by Aldaya, Bisquert, and Navarro-Salas [Phys. Lett. A **156**, 381 (1991)] in connection with a relativistic generalization of the quantum harmonic oscillator can be expressed in terms of Gegenbauer polynomials. This fact is useful in the investigation of the properties of the corresponding wave function. Some examples are given, in particular, related to the asymptotic behavior and to the distribution of zeros of the polynomials for large quantum numbers.

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Key Topics

Polynomials
Oscillators
Wave functions

Most read this month

Proof of rounding by quenched disorder of first order transitions in low-dimensional quantum systems

Michael Aizenman, **Rafael L. Greenblatt** and **Joel L. Lebowitz**
We prove that for quantum lattice systems in d □ 2 dimensions the addition of quenched disorder rounds any first order phase transition in the corresponding conjugate order parameter, both at positive temperatures and at $T = 0$. For systems with continuous symmetry the statement extends up to d □ 4 dimensions. This establishes for quantum systems the existence of the Imry–Ma phenomenon which for classical systems was proven by Aizenman and Wehr. The extension of the proof to quantum systems is achieved by carrying out the analysis at the level of thermodynamic quantities rather than equilibrium states.

Multibump solutions for quasilinear elliptic equations with critical growth

Jiaquan Liu, **Zhi-Qiang Wang** and **Xian Wu**

The current paper is concerned with constructing multibump solutions for a class of quasilinear Schrödinger equations with critical growth. This extends the classical results of Coti Zelati and Rabinowitz [Commun. Pure Appl. Math.45, 1217–1269 (1992)] for semilinear equations as well as recent work of Liu, Wang, and Guo [J. Funct. Anal.262, 4040–4102 (2012)] for quasilinear problems with subcritical growth. The periodicity of the potentials is used to glue ground state solutions to construct multibump bound state solutions.

Birth and death processes and quantum spin chains

F. Alberto Grünbaum, **Luc Vinet** and **Alexei Zhedanov**

This paper underscores the intimate connection between the quantum walks generated by certain semi-infinite spin chain Hamiltonians and classical birth and death processes. It is observed that transition amplitudes between single excitation states of the spin chains have an expression in terms of orthogonal polynomials which is analogous to the Karlin-McGregor representation formula of the transition probability functions for classes of birth and death processes. As an application, we present a characterization of spin systems for which the probability to return to the point of origin at some time is 1 or almost 1.

Most cited this month

Random Walks on Lattices. II

Elliott W. Montroll and **George H. Weiss**

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