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Heun equation and its uses in physics

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Most theoretical physicists are aware of the significant applications of the hypergeometric differential equation and it's impact was not only on Physics but also on many other areas of Science. The present talk answers the following simple question like under what conditions of the equation parameters do the differential equation. $p_n(x)\frac{d^n y}{dx^n} + p_{n-1}(x)\frac{d^{n-1} y}{dx^{n-1}} + p_{n-2}(x)y = 0$ Where, $p_j(x)$ is a polynomial of degree j, have polynomial solutions and if it does, can we construct them explicitly? The answer to this question will lead us to study the Heun equation (n=3), where we analyze the possible polynomial solutions and study some of their mathematical properties. Some applications, for example, the general deformed Hulthen potentials and Soft-core Coulomb potential will be investigated.

Recent Publications

1. G M Ismal, M Abul-Ez N M Farea and N Saad (2019) Analytical approximations to nonlinear oscillation of nanoelectro-mechanical resonators. The European Physical Journal Plus 134(1):47.
2. R L Hall, N Saad and K D Sen (2018) Exact normalized eigenfunctions for general deformed Hulthen potentials. Journal of Mathematical Physics 59.12:122103.
3. R L Hall, N Saad and Kyle R Bryenton (2018) The d-dimensional softcore Coulomb potential and the generalized confluent Heun equation. Journal of Mathematical Physics 59(10):102105.
4. K L A Kirk, Kyle R Bryenton, N Saad (2018) A note on the Generalized and Universal Associated Legendre equations. Communications in Theoretical Physics 70(1):019.
5. Ash Arsenault, Sheldon Opps and Nasser Saad (2016) Solvable potentials with exceptional orthogonal polynomials, Annalen der Physik 528(3-4):321-334.

Biography

Nasser Saad works in the area of special functions and their applications in Mathematical Physics. He is one of the founders of the Asymptotic Iteration Methods (AIM) that found many applications in all area of physics.

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