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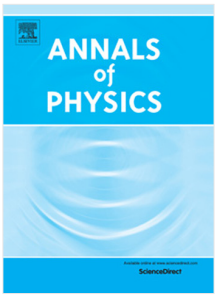

A quantum-mechanical anharmonic oscillator with a most interesting spectrum

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A quantum-mechanical anharmonic oscillator with a most interesting spectrum

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Abstract

We revisit the problem posed by an anharmonic oscillator with a potential given by a polynomial function of the coordinate of degree six that depends on a parameter λ. The ground state can be obtained exactly and its energy $E_0 = 1$ is independent of λ. This solution is valid only for $\lambda > 0$ because the eigenfunction is not square integrable otherwise. Here we show that the perturbation series for the expectation values are Padé and Borel-Padé summable for $\lambda > 0$. When $\lambda < 0$ the spectrum exhibits an infinite number of avoided crossings at each of which the eigenfunctions undergo dramatic changes in their spatial distribution that we analyze by means of the expectation values $\langle x^2 \rangle$.

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