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The Schrödinger equation for the potential $V(r) = r^2 + h/r^2 + \lambda r^2/(1+gr^2)$

There have been several investigations on the solutions of the non-relativistic Schrödinger equation with certain physical potentials, i. e. , anharmonic, nonpolynomial etc. Various techniques like super-symmetric quantum mechanics, using proper ansatz etc. have been used to derive the exact solution of the non-relativistic Schrödinger equation. In the present work, the exact solution of the Schrödinger equation for the central nonpolynomial potential $V(r) = r^2 + h/r^2 + \lambda r^2/(1+gr^2)$ in two and three dimensions have been obtained. The nonpolynomial potentials are relevant in quantum optics and field theory. The eigenfunctions and the eigenvalues obtained here may be useful for applications in these areas.

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