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Review text:

In the majority of textbooks on quantum mechanics, a thorough description of a few exactly solvable (typically, harmonic oscillator) models is usually accompanied by Rayleigh-Schroedinger perturbative analysis of their easily tractable perturbations $g x^k$ with a small coupling g , resorting to an appropriate re-summation whenever necessary. For the sufficiently large negative exponents k the resummation approach ineluctably fails. A more complicated g -dependence must be postulated (E. M. Harrell, Ann. Phys (NY) 105 (1977) 379). In the numerous methodical predecessors of the present paper an alternative possibility has been sought in the power-law asymptotic expansions using some other “small” parameters. In a subset of these papers it has been noticed that the presence of a central spike just “copies” the effect of the centrifugal term. This immediately inspired the use of the “small” (shifted and dimension-shifted) inverse angular momentum $1/\ell$ in many practical asymptotic-series calculations. New material is added in the paper under consideration. Firstly, the construction is shown feasible not only for ground states. Secondly, the mixed mathematical and physical role of the dimension is re-emphasized. Finally, an exhaustive description of the necessary formulae is accompanied by the persuasive verification of their numerical usefulness by an immediate comparison of the eighth-order results (after their Pade four-over-four re-summation) with a few available “brute force” numerical data.