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2.2.6 1D box as a limit of power-law potentials2.2.7 Spin-1/2 in the field of a wire; 2.2.8 Dimensional analysis of the time-dependent Schro-dinger equation for a hybrid harmonicquartic oscillator; 2.3 Background; 2.3.1 Bohr-Sommerfeld quantization; 2.3.2 Multi-dimensional WKB; 2.4 Problems linked to the "Background"; 2.4.1 Bohr-Sommerfeld quantization for one soft turning point and a hard wall; 2.4.2 Bohr-Sommerfeld quantization for two hard walls; 3. "Halved" Harmonic Oscillator: A Case Study; Introduction; 3.1 Solved Problems; 3.1.1 Dimensional analysis; 3.1.2 Order-of-magnitude estimate
3.1.3 Another order-of-magnitude estimate3.1.4 Straightforward WKB; 3.1.5 Exact solution; 4. Semi-Classical Matrix Elements of Observables and Perturbation Theory; 4.1 Solved problems; 4.1.1 Quantum expectation value of x6 in a harmonic oscillator; 4.1.2 Expectation value of r2 for a circular Coulomb orbit; 4.1.3 WKB approximation for some integrals involving spherical harmonics; 4.1.4 Ground state wave function of a one dimensional box; 4.1.5 Eigenstates of the harmonic oscillator at the origin: how a factor of two can restore a quantum-classical correspondence
4.1.6 Probability density distribution in a "straightened" harmonic oscillator

Sommario/riassunto

Dimensional and order-of-magnitude estimates are practiced by almost everybody but taught almost nowhere. When physics students engage in their first theoretical research project, they soon learn that exactly solvable problems belong only to textbooks, that numerical models are long and resource consuming, and that ""something else"" is needed to quickly gain insight into the system they are going to study. Qualitative methods are this ""something else"", but typically, students have never heard of them before. The aim of this book is to teach the craft of qualitative analysis using a set of p