Physics 4410 - Quantum Mechanics II – Fall 2004
Problem Set 8

Due October 27, 2004 at 11:00 AM in Duane G2B21

Reading assignment (over the next two weeks): Shankar Section 16.1 and Chapter 17; Liboff Chapter 13.

1. Shankar 16.1.3
2. Shankar 17.2.1
3. Shankar 17.2.4, part (1)
4. Consider a spinless particle of mass m in a one-dimensional harmonic oscillator:
$$\hat{H}_0 = \frac{\hat{p}^2}{2m} + \frac{m\omega^2}{2}\hat{x}^2.$$
Add a small perturbing potential $\hat{V}_1 = \kappa\hat{x}^2$.
   a.) Solve the exact energies of the full potential.
   b.) Use first-order perturbation theory to approximate the ground state energy. How does this compare to the exact calculation?
5. Liboff 13.4
6. Liboff 13.12