

**Homework # 5. Due: Friday, 10/13/2000**

1. Griffiths' problem 3.41. (Commutator algebra)
2. Griffiths' problem 3.48. (Suddenly expanding square well)
3. Using the approximate method discussed in class, find the energy levels for a particle of mass  $m$  confined to a potential  $V(x) = \frac{1}{4}\lambda x^4$ . The essence of the method consists in estimating the effective size of the well for a given energy  $E_n$ , and requiring that this size comprises  $(n+1/2)$  de Broglie wavelengths. The de Broglie wavelengths can be estimated from the maximum kinetic energy of the particle with total energy  $E_n$ .
4. Griffiths' problem 3.53. (The Virial Theorem) Ignore the second part of the very last question, if you wish. Hint: you might find it useful to (first derive and then) use the following relations:

$$[\hat{H}, x] = -i\hbar \cdot \hat{p} / m$$
$$[\hat{H}, \hat{p}] = i\hbar \cdot \frac{dV(x)}{dx} \cdot$$