Phys 163, HW#4, Due Tues 9/26

1. Problem 2.12.

2. For the harmonic oscillator, in the initial wavefunction:

$$\psi(x,0) = \frac{1}{\sqrt{2}}\psi_1 + \frac{1}{\sqrt{2}}\psi_2$$

A) Find <x> and <p> **as a function of time**! (You must time-evolve the wavefunction from the start.)
Hint: You should pull out a global phase if you can do it to make things a bit simpler, since global phases don't matter.

B) Show that <x(t)> and <p(t)> together form an acceptable solution to the **classical** harmonic oscillator. (If they don't, you've made a mistake.)

3. Problem 2.14. This is like the first problem in the previous HW.

4. A particle is in the ground state of a simple harmonic oscillator (with classical frequency ω).

A) What is the probability that the particle is measured at a position corresponding to a potential energy that is **bigger** than the ground state energy? (The probability is not zero.)

B) Immediately after such a measurement, explain the situation: Is the kinetic energy negative? Has the ground state energy changed? Has something else changed?