Phys 163, HW#5, Due Tues 10/3 (Last HW before Midterm; no late HW accepted.)

1. (4 point problem!) Problem 2.22, parts (a,b,c), including the sketch in part c. (Gaussian Wave Packet, from chapter 2.4) You can either look up the integrals or use the hint in the book.

2. (2 pts.) Combine what you know about the particle in an infinite square well, with what you know about the free particle, to solve the time-independent Schrodinger equation in "half" an infinite well. In other words, put V->infinity everywhere that x<0, and V->0 everwhere that x>0. (Hint: think about the boundary condition.)

A) Find solutions to the time-independent Schrodinger equation.

B) Are the energies quantized? Why or why not?

C) Are the solutions normalizable? If not, how could one build a normalized wavefunction?

[The rest of these problems on this HW should give you an idea of what to expect on my midterms. These are actual previous midterm problems that I've given.]

3. (1 pt.) A particle of mass "m" is in an infinite-square well of width "a". In terms of the stationary states, the wavefunction is $\psi(x) = A\left[(1+i)\psi_1 - 2i\psi_3\right]$. "A" is an unknown normalization constant. Solve for <H>, in terms of given parameters (but not "A").

4. (3 pts) Consider a particle with mass "m" in a simple harmonic oscillator potential with classical oscillation angular frequency ω. In terms of the normalized stationary state solutions, the initial wavefunction is: $\Psi(x,0) = A\left[\psi_0 - 3i\psi_3\right]$.

A) Find "A" to normalize the wavefunction.

B) Explicitly show that the uncertainty principle is satisfied at time t=0. (As always, ask me if you don't know what I mean by this question.)

C) What is the wavefunction at some later time t? (You may only use terms given in the problem, along with the normalized stationary states.)