Phys 163; HW2 Due Tues 9/12

1) a) A particle is in an infinite square well, with ground state energy E_1. Find a normalized wavefunction that has a total energy expectation value equal to $3E_1$. (It will be a superposition.) Keep all your coefficients real and positive.

b) Now time-evolve your answer from part a, to show how the wavefunction varies with time.

2) Problem 2.4 (the expectation values for the nth stationary state in the infinite square well). Hints: One shortcut for p^2 can be found by noting the relationship between p^2 and the Hamiltonian H (especially when V=0!). This is a huge shortcut: use it! Another shortcut is to use the fact that all expectation values for stationary states are constant; consider the relationship between <p> and d<x(t)>/dt from [1.33].

3) Solve the *questions* from problem 2.5 (a-e) using the *wavefunction* given in problem 2.6. (They look almost the same, except the one in 2.6 has a exp(i phi) term on the second stationary state.). For part "d", the shortcut implied by the "quick way" is to consider the relationship between <p> and <x(t)>; once you know the latter it's easy to find the former. Also, don't forget to answer all the different parts of part c).

4) In the previous problem, give an argument that adding another exp(i phi) term to the **first** stationary state (the ψ_1 term) would have the same effect as setting phi=0 in the previous problem. Hint: Your answer should make it clear that you understand the difference between a global phase and a relative phase.