Phys 163, HW#3, Due Tues 9/19

1. Problem 2.38 (the one where the well expands by a factor of 2). The key here is that the potential changes so fast that the wavefunction doesn't have time to adjust itself. It stays the same, while the stationary states (and energies) all change!

2. Problem 2.39, part a) only. (the revival time problem)

3. Take a look at the derivation of [x,p] in section 2.3.1. Following this approach, show a derivation for:

A) $[x^2,p]$

B) $[x,p^2]$

C) $[p,p^2]$

4. Knowing the commutator [A,B]=C, it's possible to replace AB by BA if you **also** throw in the commutator: AB = BA + C. Use this technique (repeatedly) to solve problem 3, parts A) and B). Hint: you can only interchange two operators at a time, but you can do this several times to move an operator from one side of a long expression to another. Check your answers match your earlier answers.

5) Starting with example 2.4, take their answer for the first excited state of the Simple Harmonic Oscillator, and use it to find the **second** excited state. Don't bother normalizing it.