Phys 511 — Prof. P. Berman
Quantum Mechanics I — Fall, 2003

Problem Set 3
Due Friday, September 26
No class Monday, October 6

The midterm exam is tentatively scheduled for Monday, October 20 from 5:30-7:00. Room to be announced.

1. Problem 7.
2. Problem 9.
3. Problem 10 and 11a.
4. Problem 22. I have done most of this problem in class. In the limit of large n show that your result agrees with the classical limit.
5. At $t = 0$, the wave function for a particle of mass m in an infinite one dimensional potential well of length L is equal to $\psi(x,0) = Ne^{-[(x-L/2)/x_0]^2}\sin[\pi x/L] = \sqrt{2/L}\sum_n a_n \sin[n\pi x/L]$, where $x_0 << L$ and N is a normalization factor. Without formally solving the problem, estimate the highest value of n which enters in the sum over eigenstates. Also estimate the time it takes for the "particle" wave function to spread to the wall if $m = 1$ gm, $x_0 = 10^{-8}$ cm, and $L = 1$ cm.

You can go to the web site **webphysics.davidson.edu/applets/java10_Archive.html** and run **QTime .** This enables you to set a potential and an intitial wave packet and watch the time development. The ends of the box act as perfectly reflecting walls so with zero potential, you have the particle in a box. Take the initial wave packet as e^{-x^2} and watch its time development for at least 65 units of time. You will see partial revivals of the wave function and, eventually, a complete revival.