Physics 3305(001)

Professor Scalise
Fall 1996

Homework Assignment #8
15 November

Due: 25 November

PROBLEMS

1. Use the first-order Euler numerical method of solving the Schrödinger Equation for the Simple Harmonic Oscillator with step size $a = 0.05$ to find for the fourth excited state ($n = 4$):

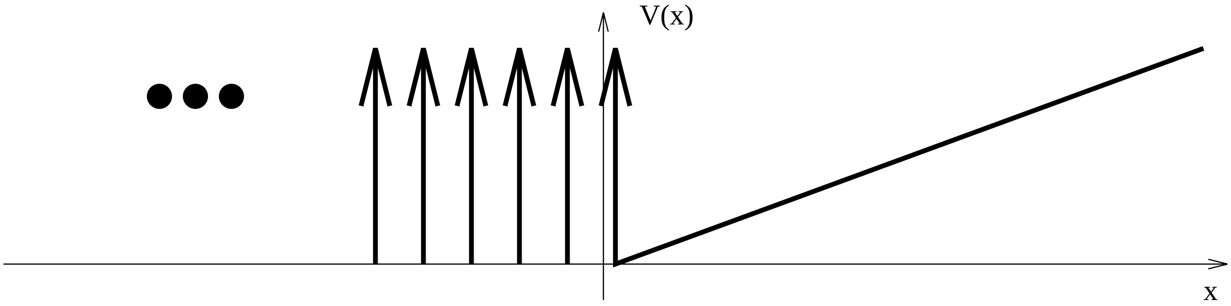
   (a) the energy E_4 to three decimal places

   (b) the graph of the space part of the wave function $\psi_4(x)$

   Be careful about the initial conditions!

2. Use the first-order Euler numerical method, but this time with step size $a = 0.01$ to find the energy of the ground state ($n = 0$). You will need to adjust N, the number of steps. Compare this to the result obtained with the larger step size, $E_0 = 0.97291(\frac{1}{2}\hbar\omega)$.

3. Given the following potential $V(x) = \begin{cases} \infty, & x < 0 \\ fx, & 0 \le x \end{cases}$



   (a) What are the "natural" units for length and energy?

   (b) What are the initial conditions?

   (c) Find the first three energy levels and plot the corresponding wavefunctions with step size $a = 0.01$.