Chem 442: Homework for lecture L11

(only turn in **BOLD** assignment first lecture next week; do <u>all</u> assignments)

1. Problem 4.2 (Page 66/67)

2. Problem 4.3 (Page 67)

Turn in 3. In class we discussed that we can expand ANY wavefunction $\Psi(x)$ as a sum of harmonic oscillator eigenstates $\varphi_n(x)$, and ANY time-dependent wavefunction $\Psi(x,t)$ as a sum of harmonic oscillator stationary states $\varphi_n(x)e^{-\frac{i}{\hbar}E_n t}$. It's a similar idea as expanding any function y(x) in a Taylor series of 1, x, x^2 and so on.

Show that the function L= $\varphi_0(x) + \varphi_1(x)$ is a wavefunction peaked on one side of x=0, and the function R= $\varphi_0(x) - \varphi_1(x)$ is a wavefunction peaked on the other side of x=0. First write down the formula for L and R, then make a plot or sketch. (You can use a graphing calculator or other software for plotting that you like.) You can see how combinations of $\Psi_0(x)$ and $\Psi_1(x)$ that change in time could give a wavefunction that wiggles back and forth, just like a classical particle on a spring would swing back and forth.