Home Work Oct 5 perturbation theory

1. Using the particle in a box wavefunction

$$\psi_n^0(x) = \sqrt{\frac{2}{L}} \sin \frac{n\pi}{L} x$$

$$E_n^0 = \frac{n^2 h^2}{8mL^2} = \frac{n^2 \eta^2 \pi^2}{2mL^2}$$

Solve for the first order corrected wavefunction for the n=1 and n=2 state for the following perturbation where L=1 atomic unit length and V_0=10 atomic unit energy and mass m=1 atomic unit weight.

$$H' = \frac{V_0 x}{L} \qquad for \;\; 0 < x < L$$

And plot it in excel file. For the summation in k use up to 11 zerth order wave functions. What is the physical meaning of the change in wavefunction shape?

$$\left|n^1\right\rangle = \sum_{k \neq n} \frac{\left\langle k^0 \left| \left(\hat{H}'\right) \right| n^0 \right\rangle}{\left(E_n^0 - E_k^0\right)} \left|k^0\right\rangle$$

$$\left|n\right\rangle = \left|n^0\right\rangle + \left|n^1\right\rangle$$