Ex. 1. Consider a spinless particle of mass $m$ in the 1-D potential:

$$V(x,t) = \begin{cases} \frac{1}{2}mu^2 + \frac{1}{2}m\alpha^2 x^2 & \text{if } x \leq a \\ 0 & \text{otherwise} \end{cases}$$

At $t = 0$, a potential $V_0 = \frac{1}{2}m\alpha^2 x^2$ is applied.

(a) Use the first-order perturbation theory to find the probability $P_{0\rightarrow n}$ to migrate to an arbitrary level $n$ of the field at $t = 0$.

(b) Simplify the transition rate using

$$\zeta = \left(\frac{\hbar}{2m}\right)^{1/2} (a^+a)$$

(c) What is $P_{0\rightarrow 1}$ and $P_{0\rightarrow 2}$? Are the other transitions allowed and why?

If the particle carries a charge $-q$, the Hamiltonian in the presence of an electric field $E = E \hat{x}$ is now

$$H = \frac{p^2}{2m} + V(x) + qEx$$

Define the eigenstates of the ground state and first excited state ($\psi$).

(Shift $\psi$ to solve the Schrödinger equation).
In a and L/
the particle's velocity changes to
the previous direction to decrease the

\[ v(x, t) = -v(y, x) \]

to the previous event's magnitude.

6. Repeat 4 and 5 for all other forces.

in a higher spin store.
and energy which hit 2 particles are
0 until the ground that wave function

\[ V(x) = \begin{cases} \infty & x < -\infty \\ 0 & -\infty < x < \infty \end{cases} \]

E=2 - initial speed. The force was more

\[ x > 0 \]