3. A particle of mass m moves in one-dimension in the infinite square well (see Eq. 5.2.1. of Shankar). Suppose that at time $t = 0$ its wave function is

$$\psi(x, t = 0) = A\left[(L/2)^2 - x^2\right], \tag{1}$$

where A is a normalization constant.

a. Find the probability P_n of obtaining the value E_n of the particle energy, where E_n is one of the energy eigenvalues.

b. Determine the expectation value $\langle E \rangle$ of the energy. What is the probability that the particle's energy at time $t = 0$ is equal to its expectation value.

c. What is $\psi(x, t)$?

4. Consider $V(x) = -aV_0\delta(x - L) - aV_0\delta(x + L)$. Find the bound states energies and their wavefunctions.