StudentID: _____

PHYS 451 Quantum Mechanics II (Fall 2018)
Quiz #2

Consider a particle of mass m moving in an infinite square well potential,

$$V(x) = \begin{cases} 0, & 0 \leq x \leq a \\ \infty, & \text{otherwise} \end{cases} .$$

The system is now subjected to a perturbation in the form

$$H' = \begin{cases} \beta, & 0 \leq x \leq a \\ \gamma, & \text{otherwise} \end{cases} ,$$

where β and γ are constants. Treat this perturbed system in the framework of the perturbation theory and answer the following questions:

1. Is there any restriction on the values of β and γ so that the application of the perturbation theory remains valid? Be specific, i.e. do not just say β must be large or small.

2. What is the first-order correction to the energy of the n-th state?

3. What is the second-order correction to the energy of the ground state?

4. Do the results you obtained in parts 2 and 3 make sense? Why?