PHYS 452 Quantum Mechanics II (Fall 2019)
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

$$H'(x) = \begin{cases} A, & 0 \leq x \leq \frac{a}{2} \\ 0, & \frac{a}{2} \leq x \leq a \end{cases},$$

where A is a positive constant.

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

2. Is there any restriction on the value of A so that the application of the perturbation theory remains valid? Be specific, i.e. do not just say it must be large or small.

Note: Taking into account the symmetry may make your calculations easier.