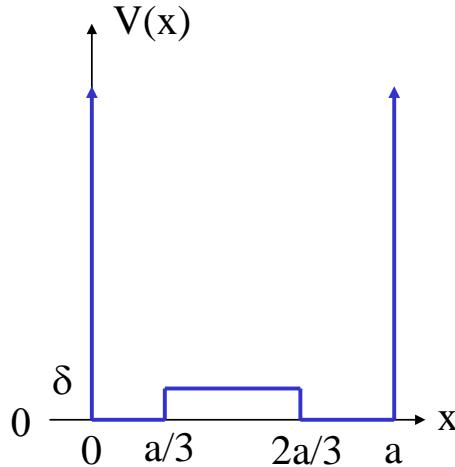


## 1D Infinite Square Well Perturbation



$$H^0 = -\frac{\hbar^2}{2m} \frac{d^2}{dx^2} + V(x) \text{ where } V(x) = \begin{cases} 0 & \text{for } 0 < x < a \\ \infty & \text{for } x < 0, x > a \end{cases}$$

The unperturbed eigenvalues and eigenfunctions are:

$$E_n^0 = \frac{n^2 \pi^2 \hbar^2}{2ma^2}$$

$$\psi_n^0(x) = \begin{cases} \sqrt{\frac{2}{a}} \sin\left(\frac{n\pi x}{a}\right) & \text{for } 0 < x < a \\ 0 & \text{for } x < 0, x > a \end{cases}$$

Here  $n$  is a positive integer.

The perturbing Hamiltonian is this:

$$H'(x) = \begin{cases} \delta & \text{for } a/3 < x < 2a/3 \\ 0 & \text{for } x < a/3, x > 2a/3 \end{cases}$$

where  $\delta$  could be a positive or negative energy. This represents a small “brick” placed in the bottom of the infinite square well.

