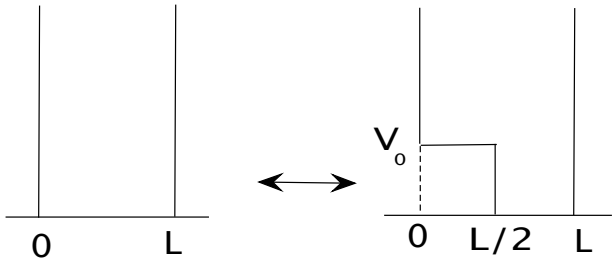
2. A particle of mass m is confined to the interval $[0, L]$ by a one -dimensional infinite square well. It is initially in the ground state of the Hamiltonian with the confining potential.

a) At time $t = 0$ the potential *within the well* is suddenly changed to:

$$V(x) = \begin{cases} V_0, & \text{for } 0 < x < L/2 \\ \\ 0, & \text{for } L/2 < x < L \end{cases}$$

with $V_0 \ll E_1 - E_0$ (the latter being the gap between the two lowest states of the initial operator).



The perturbation lasts for time T, after which the potential is restored to its initial value. What is the probability that after the potential is restored the particle's energy is E_1, calculated to first order in $V_0/(E_1 - E_0)$?

b) In a second experiment the value of V_0 (in the perturbing potential, as above) is increased very slowly, and to a much higher value $\overline{V} \gg E_1$. It is switched off instantaneously when that value is reached. What is the probability that at this point the particle will have the energy E_1.