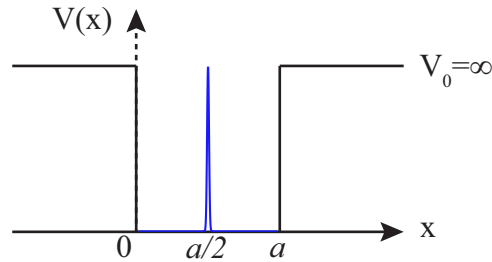


Problem 9.1: Dirac-delta Perturbation

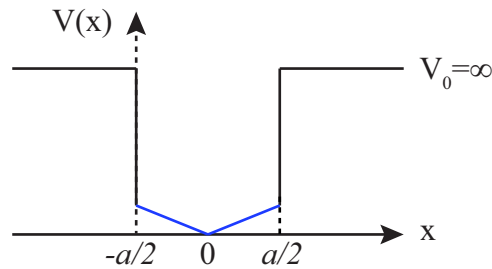
Consider a particle of mass M in the potential as shown in the figure. The potential is in the form of a Dirac-delta disturbance in the middle of an infinite-well potential. The potential is given by $V(x) = V_0(x) + V_p(x)$, where $V_0(x)$ is the infinite-well potential and $V_p(x) = \alpha\delta(x - a/2)$ is the Dirac-delta potential with a very small α



- (a) Find the first-order corrections to the energy of the n^{th} stationary state.
- (b) Are the energies of the even n states perturbed? Explain why?
- (c) Find the first three terms in first-order correction to the ground state wave function.
- (d) Find the second-order correction to the energy of the n^{th} stationary state.

Problem 9.2: V-Perturbation

Consider a particle of mass M in the potential as shown in the figure. The potential is given by $V(x) = V_0(x) + V_p(x)$, where $V_0(x)$ is the infinite-well potential and $V_p(x) = \frac{2\alpha}{a}|x|$, where α is very small.



- (a) Find the first-order corrections to the energy of the n^{th} stationary state.
- (b) Find the first two terms in first-order correction to the ground state wave function.