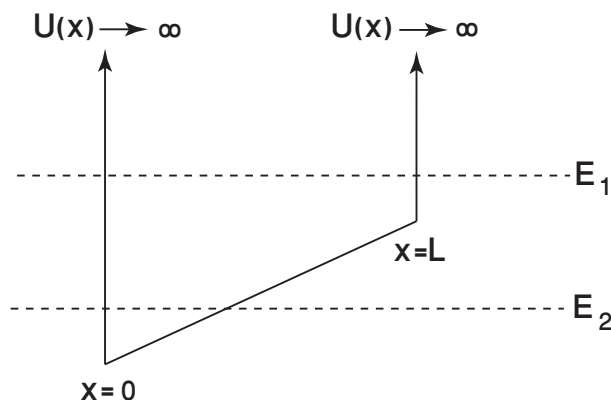


Tutorial 4: Modern Physics

1. Consider a particle that is bound inside an infinite well whose “floor” is sloping as shown on the next page.



Sketch a plausible wave function when the energy is E_1 and when the energy is E_2 .

2. In an infinite well, consider the 1st excited state, i.e., $n = 2$.
- What is the most probable position of the particle after a measurement has been made?
 - What is the average position, $\langle x \rangle$?
3. The nuclear potential that binds protons and neutrons in the nucleus of an atom is often approximated by a square well. Imagine a proton confined in an infinite square well of length 10^{-5} nm, a typical nuclear diameter. Calculate the wavelength and energy associated with the photon that is emitted when the proton undergoes a transition from the first excited state ($n = 2$) to the ground state ($n = 1$). In what region of the electromagnetic spectrum does this wavelength belong?