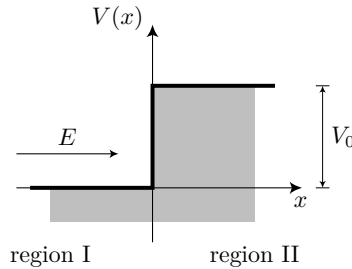


PHYS 631: Quantum Mechanics I (Fall 2020)
Exercises 9 November 2020 (Monday, Week 7)
Due Monday, 16 November 2020

Exercise 1. Consider a particle incident on a step potential, with $V_0 > E > 0$, as shown below.



We constructed scattering-type solutions with an unnormalizable plane-wave input and reflected components, and an exponentially decaying part in region II called the **evanescent wave**. Clearly the evanescent wave is normalizable, and so in some sense it's much “smaller” (vanishingly less area) than the input and reflected waves.

Now suppose that you perform a measurement that detects whether the particle is in region II. Does this mean that it's impossible to ever observe the particle there? (The answer is that, in fact, you *can* set things up to observe the evanescent wave, so the point of this exercise is to explain how this could work.)

Exercise 2. Based on what you know about scattering from the finite square barrier and finite square well, discuss the bound states of the **infinite pedestal** potential, defined by

$$V(x) = \begin{cases} 0, & x \in (0, L) \\ -\infty, & x \notin (0, L), \end{cases} \quad (1)$$

and illustrated below.

