PHYS 451: Quantum Mechanics I – Spring 2016
Quiz #3

Consider a potential barrier in the form of the delta function,

$$V(x) = \alpha\delta(x) \qquad (\alpha > 0).$$

Remember that one of the universal properties of the wave function is that it must be continuous. The first derivative of the wave function, however, may have a discontinuity at the points of singularity.

(a) Determine the magnitude of the jump of the first derivative of the wave function at the point $x = 0$ in terms of the wave function value at this point. You can do it by integrating the Schrödinger equation over an infinitely small region around that point (i.e. from $-\epsilon$ to ϵ).

(b) Find the transmission coefficient through this potential barrier as a function of particle's energy.