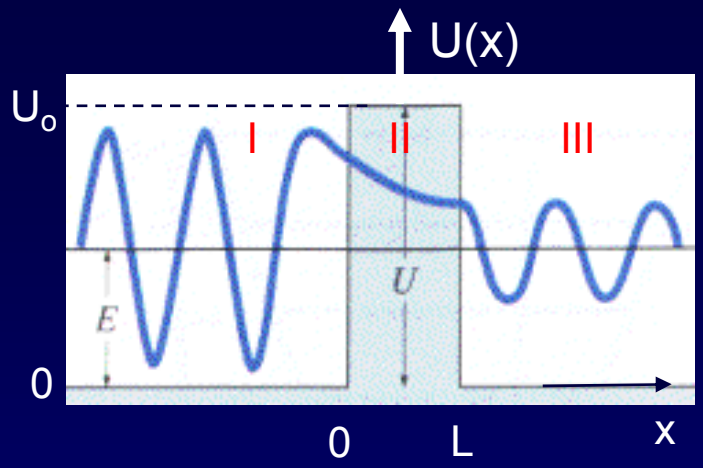
Tunneling Through a Barrier (1)

What is the the probability that an incident particle tunnels through the barrier?
It's called the "Transmission Coefficient, T".

Consider a barrier (II) of height U_0.
U = 0 everywhere else.



Getting an exact result requires applying the boundary conditions at x = 0 and x = L, then solving six transcendental equations for six unknowns:

$$\psi_I(x) = A_1 \sin kx + A_2 \cos kx$$

$$\psi_{II}(x) = B_1 e^{Kx} + B_2 e^{-Kx}$$

$$\psi_{III}(x) = C_1 \sin kx + C_2 \cos kx$$

A_1, A_2, B_1, B_2, C_1, and C_2 are unknown. K and k are known functions of E.

This is more complicated than the infinitely wide barrier, because we can't require that $B_1 = 0$. (Why not?)