Physics 469, Midterm 2 11/19/03

Problem 1
A stream of low energy electrons strikes a potential barrier from the left, as pictured below.

Using the usual forms for the wave function

$$\psi_0 = A\sin k_0 x + B\cos k_0 x \text{ where } k_0 = \sqrt{\frac{2mE}{h^2}}$$

$$\psi_1 = Ce^{kx} + De^{-kx} \text{ where } k = \sqrt{\frac{2m}{h^2}(U_o - E)}$$

evaluate the constants B, D in terms of A by applying the boundary conditions at x=0.

1st, $C = 0$ so $\psi(\infty)$ is finite

Then Continuity of $\psi \Rightarrow$

$$\psi_0(0) = \psi_1(0)$$

Continuity of $\psi' \Rightarrow$

$$\frac{d\psi_0(0)}{dx} = \frac{d\psi_1(0)}{dx}$$