

**Solution**

Region 1:  $x < -a$ , region 2:  $a > x > -a$ , region 3:  $x > a$ .

$$\psi_1(x) = Ae^{ikx} + A_R e^{-ikx}, \quad \psi_2(x) = Ce^{ik'x} + De^{-ik'x}, \quad \psi_3(x) = A_T e^{ikx}$$

where  $k = \frac{1}{\hbar} \sqrt{2mE}$ ,  $k' = \frac{1}{\hbar} \sqrt{2m(E - V_0)}$ .

Continuity of  $\psi(x)$  and  $\psi'(x)$ :

$$\begin{array}{l} x = -a \\ Ae^{-ika} + A_R e^{ika} = Ce^{-ik'a} + De^{ik'a} \\ Ae^{-ika} - A_R e^{ika} = \frac{k'}{k}(Ce^{-ik'a} - De^{ik'a}) \\ \Rightarrow A = C \frac{k+k'}{2k} e^{i(k-k')a} + D \frac{k-k'}{2k} e^{i(k+k')a}, \quad C = \frac{k+k'}{2k'} A_T e^{i(k-k')a}, \quad D = \frac{k-k'}{2k'} A_T e^{i(k+k')a}, \end{array}$$

so

$$\begin{aligned} \frac{A_T}{A} &= e^{-2ika} \left[ \frac{(k+k')^2}{4kk'} e^{-2ik'a} + \frac{(k-k')^2}{4kk'} e^{2ik'a} \right]^{-1} \\ \Rightarrow \left| \frac{A_T}{A} \right|^2 &= \left[ 1 + \frac{(k^2 - k'^2)^2}{4k^2 k'^2} \cos^2 2k'a \right]^{-1} \end{aligned}$$