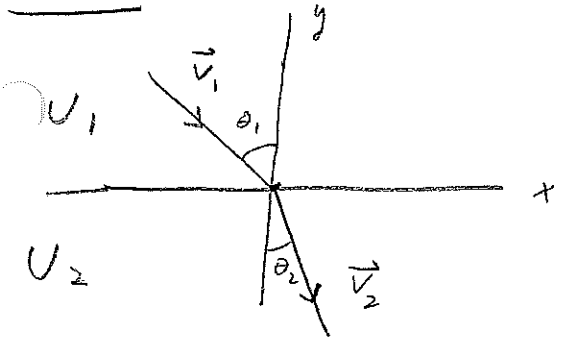
Section 7:



$U_1 = \text{const}$, $U_2 = \text{const}$

$P_x = \text{const}$ (since no x dependence)

$P_{x1} = m v_{1x} = m v_1 \sin\theta_1$

$P_{x2} = m v_{2x} = m v_2 \sin\theta_2$

Thus, $v_1 \sin\theta_1 = v_2 \sin\theta_2$ (1)

Also, $E = \text{const}$ since U_1, U_2 are time-indep.

$$\frac{1}{2} m v_1^2 + U_1 = \frac{1}{2} m v_2^2 + U_2 \qquad (2)$$

Using (1) and (2)

$$\frac{\sin\theta_1}{\sin\theta_2} = \frac{v_2}{v_1}$$

Now, (2) implies

$$\frac{1}{2} m v_2^2 = \frac{1}{2} m v_1^2 + (U_1 - U_2)$$

$$v_2^2 = v_1^2 + \frac{2(U_1 - U_2)}{m}$$

$$\left(\frac{v_2}{v_1}\right)^2 = 1 + \frac{2(U_1 - U_2)}{m v_1^2}$$

So

$$\frac{\sin\theta_1}{\sin\theta_2} = \sqrt{1 + \frac{2(U_1 - U_2)}{m v_1^2}}$$

NOTE: if $\theta_1 > \theta_2$, $v_2 > v_1$, $U_2 < U_1 \rightarrow U_1 - U_2 > 0$