HW 11/6

6.13)

$$\psi(x) = A'e^{ikx} + B'e^{-ikx} = A'(\cos kx + i\sin kx) + B'(\cos(-kx) + i\sin(-kx))$$

$$= (A' + B')\cos kx + i(A' - B')\sin kx$$

$$= \left(\tfrac{1}{2}[B - iA] + \tfrac{1}{2}[B + iA]\right)\cos kx + i\left(\tfrac{1}{2}[B - iA] - \tfrac{1}{2}[B + iA]\right)\sin kx$$

$$= \tfrac{1}{2}(2B)\cos kx + i\left(\tfrac{1}{2}(-2iA)\right)\sin kx = B\cos kx + A\sin kx \quad \checkmark$$

6.14)

$$4\frac{\sqrt{E(E-U_0)}}{(\sqrt{E} + \sqrt{E-U_0})^2} + \frac{(\sqrt{E} - \sqrt{E-U_0})^2}{(\sqrt{E} + \sqrt{E-U_0})^2} = \frac{4\sqrt{E(E-U_0)} + E - 2\sqrt{E(E-U_0)} + (E-U_0)}{(\sqrt{E} + \sqrt{E-U_0})^2}$$

$$= \frac{E + 2\sqrt{E(E-U_0)} + (E-U_0)}{(\sqrt{E} + \sqrt{E-U_0})^2} = \frac{(\sqrt{E} + \sqrt{E-U_0})^2}{(\sqrt{E} + \sqrt{E-U_0})^2} = 1 \quad \checkmark$$

ep33)

$E = 5\,\text{eV}$ @ $U = 0$

$$R = \frac{(\sqrt{E} - \sqrt{E-U_0})^2}{(\sqrt{E} + \sqrt{E-U_0})^2} \rightarrow 0.25 = \frac{(\sqrt{5} - \sqrt{E-U_0})^2}{(\sqrt{5} + \sqrt{E-U_0})^2}$$

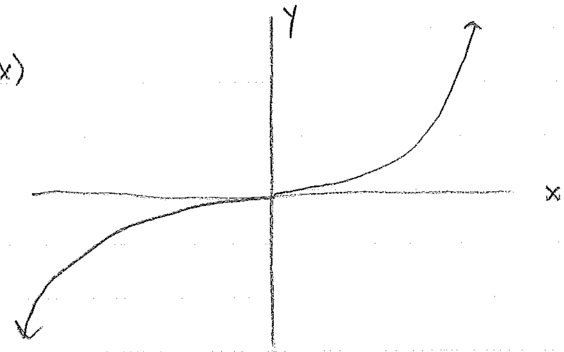
$$\rightarrow 0.5 = \frac{\sqrt{5} - \sqrt{E-U_0}}{\sqrt{5} + \sqrt{E-U_0}} \rightarrow \frac{\sqrt{5}}{2} + \frac{\sqrt{E-U_0}}{2} = \sqrt{5} - \sqrt{E-U_0}$$

$$\frac{3}{2}\sqrt{E-U_0} = \frac{\sqrt{5}}{2}$$

$$\sqrt{E-U_0} = \frac{\sqrt{5}}{3}$$

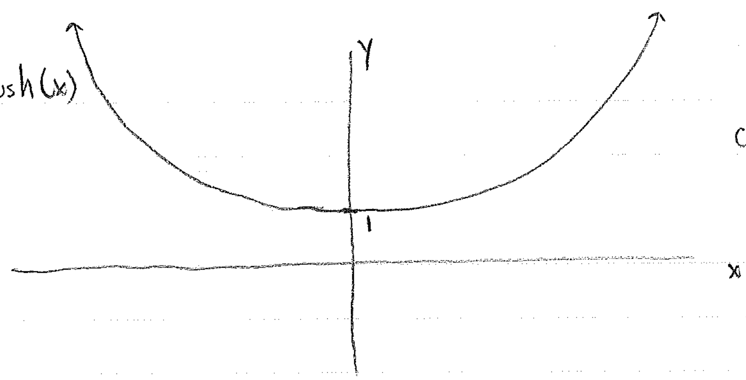
$$\boxed{E - U_0 = \frac{5}{9}\,\text{eV}}$$

ep34) a) $\sinh(x)$



$$\sinh(x) = \frac{1}{2}(e^{x} - e^{-x})$$

b) $\cosh(x)$



$$\cosh(x) = \frac{1}{2}(e^{x} + e^{-x})$$