13.2)

Bryan Berns

$$\Gamma = \frac{\sqrt{1}-\sqrt{2}}{\sqrt{1}+\sqrt{2}} = -.1716$$

since coming from left, the initial and reflect components add:

$$(1+|\Gamma|)E_i = 11.716 \text{ V/m}$$

$$|H| = \frac{|E|}{\eta_0} = .031 \text{ A/m}$$

13.4)

$$T = \frac{2\sqrt{1}}{\sqrt{1}+\sqrt{1.75}} = .86 \qquad P_2 = \frac{(T \cdot \sqrt{P_1 \eta_0})^2}{\eta_2}$$

a)

$$P_1 = \frac{E_i^2}{\eta_0} \qquad \frac{E_2^2}{\eta_2} = P_2 \qquad E_2 = E_i \cdot T \qquad P_2 = \left[\frac{(624.8^2)(1)}{\frac{\eta_0}{\sqrt{1.75}}}\right] \cdot 25\% = 343.2 \text{ W/m}^2$$

$$\text{efficiency} = \frac{P_2}{P_1} = \frac{343.2}{1400} \approx 24.5\%$$

b)

$25\% \cdot 1400 = 350$

$$\frac{350}{1400} = 25\% \text{ effiency.}$$

since there is no boundary, essentially

13.5)

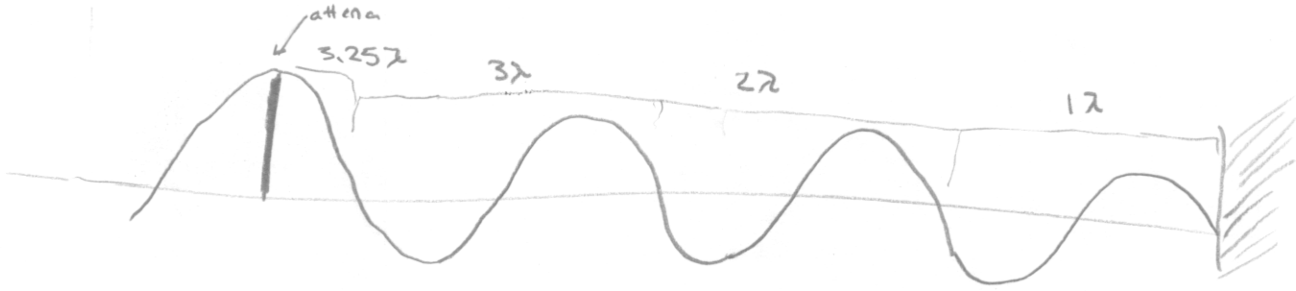
$$T = \frac{2}{\sqrt{1}+\sqrt{1.8}} = +.854 \qquad \Gamma = 1 - T = .1459$$

$$P = \frac{E_i^2}{\eta} = .1 \Rightarrow E_i = 6.14 \qquad E_2 = (T)(6.14) = 5.24 \qquad H_2 = \frac{E}{\eta} = .0186 \text{ A/m}$$

$$E_1 = E_i(1+\Gamma) = 7.035 \text{ V/m} \qquad H_1 = \frac{E_1}{\eta_0} = .01866 \text{ A/m}$$

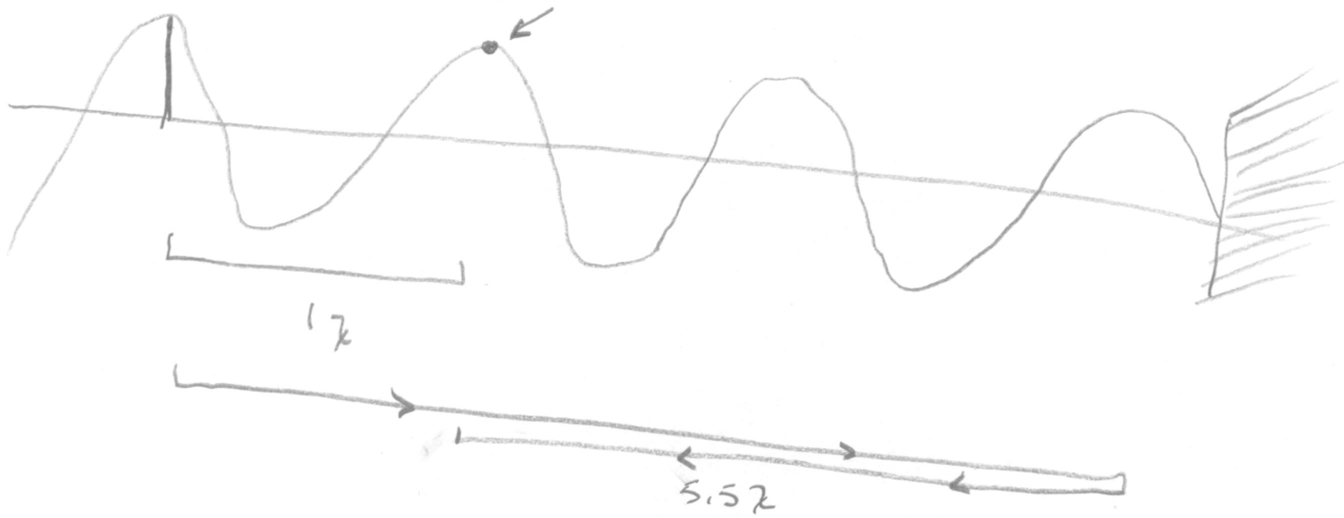
13.5 cont) $P_T = A \cdot |H| \cdot |E| = \left(\frac{10^{-4}}{2}\right)^2 \cdot E_2 \cdot H_2 = 7.68 \times 10^{-10}$ W

13.8) a)



$z = 3.25\lambda$ or 39m

b)



so $E = E_0 e^{-\alpha 1\lambda} + E_0 e^{-\alpha 5.5\lambda}$

$$\alpha = \frac{\sigma \eta_0}{2\sqrt{\epsilon}} = 9.424 \times 10^{-4}$$

$$E = 100e^{-12(9.42\times10^{-4})} + 100e^{-66(9.42\times10^{-4})} = 192.84 \text{ V/m}$$