EE3140 Quiz 3, Spring 2002

Show your work for full credit. Useful formulae:

\[ \varepsilon_0 = 8.854 \times 10^{-12} \text{ F/m} \]
\[ \mu_0 = 4\pi \times 10^{-7} \text{ H/m} \]

1. The amplitude of \( \vec{E} \) just inside a liquid is 10.0V/m and \( \text{Re}\{\varepsilon\} = 20 \times \varepsilon_0 \), with \( \sigma = 0.5mho/m \). Determine the amplitude of \( \vec{E} \) at a distance of 0.1m inside the medium for \( f=5\text{MHz} \). (5 points)

\[
K = \sqrt{\frac{\mu_m \varepsilon_0}{1 - \frac{\sigma}{\omega \varepsilon_0}}} = 3.159 - j3.124 \\
(\text{also, note that } \frac{\sigma}{\omega \varepsilon_0} \gg 1) \\
K = \sqrt{\frac{\mu_m \varepsilon_0}{2}} (1 - j) = 3.159 - j3.142 \\
10 e^{-jKx(0.1)} = 7.32 V/m
\]

2. Given \( \vec{E} = ((2-j)x + (3-j)z) \exp^{-jy} \),

(a) What direction is the wave traveling? (2 points)

+\( y \)-direction

(b) What polarization does this wave have, linear, circular, or elliptical? (3 points)

elliptical