Fields and Waves I                                  Lesson 5.4
Polarization and Propagation Direction

Reading assignment
Ulaby, 7-3

Problem 1 - polarization
Consider a wave travelling in the z direction whose electric field is given by
\[ \mathbf{E}(z,t) = 3 \cos(\omega t - \beta z)\mathbf{a}_x + C \cos(\omega t - \beta z + \phi)\mathbf{a}_y. \]
Describe the polarization (e.g. linear, right circular, etc.) and on an xy plot sketch the locus of \( \mathbf{E}(0,t) \) over a cycle for the following cases.

a) \( C = 4 \, \text{V/m}, \, \phi = 0^\circ \)
b) \( C = 3 \, \text{V/m}, \, \phi = 45^\circ \)

Problem 2 - Arbitrary propagation angle
The direction of \( \mathbf{E} \) and \( \gamma \) of an electromagnetic wave with \( \lambda = 500 \, \text{nm} \) are shown below. The wave is traveling through air. The electric field has a magnitude of 30 V/m. What are the \( \mathbf{E} \) and \( \mathbf{H} \) phasors?

[Diagram showing \( \mathbf{E} \) and \( \gamma \) angles with \( z \) axis out of the page]