Reading assignment
Ulaby, 8-2, 8-4, 8-5
Connor and Salon, Unit X (On Waves & Materials)

Problem 1 - oblique incidence
A plane wave described by \( E_i = 100 \cos(\omega t - \pi x - 1.73\pi z) a_y \) V/m is incident upon a dielectric material with \( \varepsilon_r = 4 \).

a. Write \( E \) in phasor form.

b. What are \( \gamma_i \) and \( \theta_i \)?

c. What are \( \theta_t \) and \( \gamma_t \)?

d. What are the reflection and transmission coefficients?

e. Write the total electric field phasors in both regions.

f. Confirm your results by running polariz.m

Problem 2 - Snell’s law, critical angle
For visible light, the index of refraction for water is \( n = 1.33 \). If we put a light source 1 meter under water and observe it from above the surface of the water, what is the largest \( \theta_i \) for which light will be transmitted?

How large will the circle of illumination be?

Problem 3 - polarization
Consider the same material properties and incident angle as Problem 1, but assume the opposite polarization.

a. What are the reflection and transmission coefficients?

Which polarization has a lower reflection coefficient (magnitude)?
b. Now allow $\theta_i$ to vary. At what value of $\theta_i$ is the wave completely transmitted? (i.e. What's the Brewster angle?)