Phys 531 Assignment 12 Due November 21

1. Suppose light in air is incident upon metal having a complex index of refraction $\tilde{n} = 3 + 5i$. Numerically compute a plot of the reflectances $\mathcal{R}_x$ and $\mathcal{R}_y$ vs. the angle of incidence θ_1 between 0° and 90°. (Hint: find a program that can handle complex numbers, and have it evaluate the Fresnel equations for you.)

2. Saleh and Teich Problem 6.2-2, page 236.

3. Saleh and Teich Problem 6.2-3, page 236.

4. Saleh and Teich Problem 6.3-1, page 236.

5. (3 pts) Consider a plane wave incident on a uniaxial medium with indices n_o and n_e, as illustrated below. The angle of incidence is θ_1, and the optic axis of the medium is tangent to the surface and in the plane of incidence.
(a) Calculate the refraction angle θ_2 for both TE and TM polarizations. (Note tht θ_2 here is not the angle between the refracted wave and the optic axis!)
(b) In general, the Poynting vector $\mathbf{S}$ is not parallel to $\mathbf{k}$ in an anisotropic medium. In class we found the angle of $\mathbf{S}$ to satisfy

$$\tan\alpha = \frac{n_e^2}{n_o^2}\tan\theta_2$$

for TM polarization. If $\theta_1 = 30°$ and the medium is calcite with $n_o = 1.66$ and $n_e = 1.49$, evaluate θ_2 and α for both polarizations.