PHYS302 Fall 2023

Homework 3

1. 4.8 from Hecht

4.8* **Figure P.4.8** shows what's called a corner mirror. Determine the direction of the exiting ray with respect to the incident ray.

Figure P.4.8

2. 4.15 from Hecht

4.15* A ray of yellow light from a sodium discharge lamp falls on the surface of a diamond in air at 45°. If at that frequency $n_d = 2.42$, compute the angular deviation suffered upon transmission.
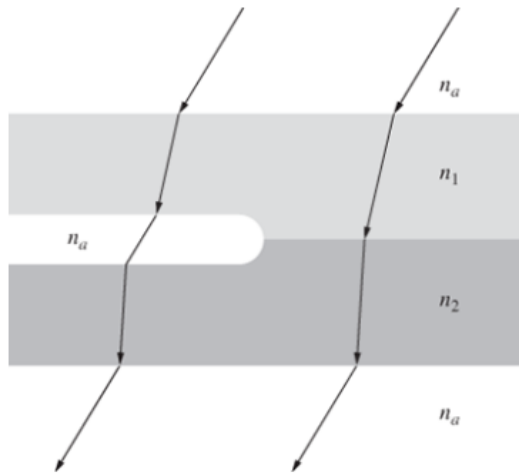
3. 4.23 from Hecht

4.23* An exceedingly narrow beam of white light is incident at 60.0° on a sheet of glass 10.0 cm thick in air. The index of refraction for red light is 1.505 and for violet light it's 1.545. Determine the approximate diameter of the emerging beam.

4. 4.39 from Hecht

4.39* Show that the two rays that enter the system in **Fig. P.4.39** parallel to each other emerge from it being parallel.

Figure P.4.39

5. 4.54 from Hecht

4.54* We know that 1000 W/m^2 of unpolarized light is incident in air on an air–glass interface where $n_{ti} = 3/2$. If the transmittance for light with its E-field perpendicular to the plane of incidence is 0.80, how much of that light is reflected?

6. 4.84 from Hecht

4.84* A fish looking straight up toward the smooth surface of a pond receives a cone of rays and sees a circle of light filled with the images of sky and birds and whatever else is up there. This bright circular field is surrounded by darkness. Explain what is happening and compute the cone angle.

7. (E.C.) 4.36 from Hecht: Derive the Law of Reflection by using the calculus to minimize the transit time, as required by Fermat's Principle.