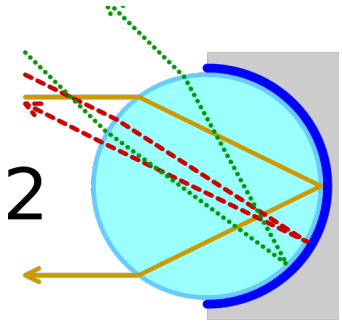
PHYS3038 Fall 2015

Homework #3

Due date: 29 September 2015

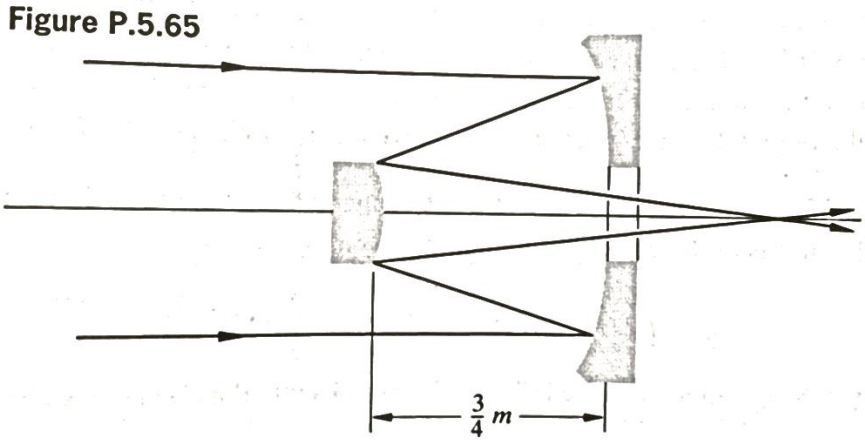
5.54 A thin lens having a focal length of +50.0 cm is positioned 250 cm in front of (i.e., to the left of) a plane mirror. An ant sits on the central axis 250 cm in front of (i.e., to the left of) the lens. Locate the three images of the ant.

5.57 There are several varieties of retro-reflector that are commercially available; one type is comprised of transparent spheres, the backs of which are silvered. Light is refracted at the front surface, focused onto the rear surface, and there reflected back out in the direction it came. Determine the necessary index of refraction of the spheres. Assume the incident light is collimated.



5.65 A homemade telephoto "lens" (Fig.P.5.65) consists of two spherical mirrors. The radius of curvature is 2.0 m for the primary and 60 cm for the secondary. How far from the smaller mirror should the film plane be located if the object is a star? What is the effective focal length of the system?

Figure 5.65



5.75 Using the information on the eye in Section 5.7.1, compute the approximate size (in millimeters) of the image of the Moon as cast on the retina. The Moon has a diameter of 2160 miles and is roughly 230000 miles from here, although this, of course, varies.

6.1 Work out the details leading to Eq. (6.8).

Eq. (6.8): $\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} - \frac{d}{f_1 f_2}$

6.10 It is found that sunlight is focused to a spot 29.6 cm from the back face of a thick lens, which has its principal points H_1 at $+2.0$ cm and H_2 at -0.4 cm. Determine the location of the image of a candle that is placed 49.8 cm in front of the lens.

6.14 A compound lens is composed of two thin lenses separated by 10 cm. The first of these has a focal length of +20 cm, and the second a focal length of -20 cm. Determine the focal length of the combination and locate the corresponding principle points. Draw a diagram of the system.