

Homework # 2  
due Wednesday Oct 6 at 5PM

Reading: Hecht 5.2, 5.4, 6.1, 6.2

Problems:

1. A concave mirror forms an image on a screen twice as large as the object. Both object and screen are then moved to produce an image on the screen that is three times the size of the object. If the screen is moved 75 cm in the process, how far is the object moved? What is the focal length of the mirror?
2. Determine the minimum height of a wall mirror that will permit a 6-ft person to view his entire height. Sketch rays from the top and bottom of the person, and determine the proper placement of the mirror such that the full image is seen, regardless of the person's distance from the mirror.
3. To determine the refractive index of a transparent plate of glass, a microscope is first focused on a tiny scratch in the upper surface, and the barrel position is recorded. Upon further lowering the microscope barrel by 1.87 mm, a focused image of the scratch is seen again. The plate thickness is 1.50 mm. What is the reason for the second image, and what is the index of refraction of the glass?
4. A meter stick lies along the optical axis of a convex mirror of focal length 40 cm, with its nearer end 60 cm from the mirror surface. How long is the image of the meter stick?
5. (Hecht 5.12) A meniscus concave glass ( $n_l=1.5$ ) thin lens (see figure) has radii of curvature of +20.0 cm and +10.0 cm. If an object is placed 20.0 cm in front of the lens, show that the image distance will be -13.3 cm. Describe that image and draw a ray diagram.

