

PHYS 3800 “Optics”

Homework “Geometric Optics”

- 1) Determine the minimum height of a wall mirror that will permit a 6-ft (183 cm) person to view his/her entire height. Sketch rays from top and bottom of the person and determine the proper placement of the mirror such that the full image can be seen, regardless of the person's distance to the mirror.
-

- 2) 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.
- (a) If the screen is moved 75 cm in the process, how far is the object moved?
- (b) What is the focal length of the mirror?
-

- 3) A convex thin lens with refractive index of $n=1.5$ has a focal length of 30cm in air. When immersed in a certain transparent liquid, it becomes a negative lens with a focal length of 188 cm. Determine the refractive index of the liquid!
-

- 4) A small object is placed 20 cm from the first of a set of three lenses with focal lengths, in order, of 10 cm, 15cm, and 20cm. The first two lenses are separated 30cm and the last two 20cm. Calculate the final image position relative to the last lens as well as its linear magnification relative to the original object, if
- (a) all three lenses are positive;
- (b) the middle lens is negative; and
- (b) the first and last lenses are negative.

Provide a ray-diagram for each case.

- 5) An airplane is used in aerial surveying to make a map of ground detail. If the scale of the map is to be 1:50,000 and the camera used has a focal length of 6 inch, determine the proper altitude for the photograph.