1. Sketch a simple ray diagram for an image formed by a concave mirror, including the object. Using this diagram and simple trigonometry, demonstrate that the ratio of image height to object height equals the ratio of image distance to object distance and under what conditions this is true.

2. An object (height =1.5 cm) is viewed through a concave spherical mirror (f=5 cm). Determine the location, height and orientation of the image for the following distances the object is held away from the lens. Verify your calculations using crude ray diagrams.

   a. p = 35 cm?

   b. p = 5 cm?

   c. p = 2 cm?

3. An object (height = 2 cm) is viewed through a convex spherical mirror (f = -10 cm). Determine the location and height of the image for the following distances the object is held away from the lens. Verify your calculations using crude ray diagrams.

   a. p = 35 cm?

   b. p = 10 cm?

   c. p = 5 cm?

4. A convex rearview mirror has a radius of curvature of 16.0 m.

   a. Determine the location of the image and its magnification for an object 10.0 m from the mirror.

   b. How tall does a car (height = 1.6 m) appear through the rearview mirror when it is 10.0 m from the mirror?

5. An object (height=10 cm) is viewed through a converging lens (f=10 cm). Determine the location and height of the image for the following distances the object is held away from the lens. Verify your calculations using crude ray diagrams.

   a. p = 35 cm?

   b. p = 15 cm?

   c. p = 5 cm?

   d. p = 20 m?

6. An object (height=10 cm) is viewed through a diverging lens (f=10 cm). Determine the location and height of the image for the following distances the object is held away from the lens. Verify your calculations using crude ray diagrams.

   a. p = 35 cm?

   b. p = 15 cm?

   c. p = 5 cm?

   d. p = 20 m?

7. An object (height =10 cm) is viewed through an optical device containing 2 converging lens separated by 35 cm. For this device, the objective lens has a focal length of 20 cm and the eyepiece has a focal length of 5 cm. If the object is located 500 cm away from the objective: determine the location and height of the final image for the following distances the object is held away from the lens. Verify your calculations using crude ray diagrams.

   a) Determine the location of the image formed by the objective lens.

   b) Determine the height of the image formed by the objective lens.

   c) Determine the location of the final image from the eyepiece and the objective, respectively.

   d) Determine the height of the final image.

   e) Determine the final magnification of the image.

8. Assume that the "effective" lens of the eye is located 1.8 cm from the retina. Determine the focal length and optical power (in diopters) of the eye (lens) when an object is located:

   a) 25 cm from the eye.

   b) 30 m from the eye.

   c) 1000 m from the eye.

9. A particular far-sighted person has a near point of 100 cm. This person wears reading glasses to read a newspaper at a distance of 25 cm. Determine the focal point of the reading glasses and the lens power.

10. A nearsighted person has near and far points of 12 cm and 17 cm, respectively.

a) What focal length and lens power of corrective eyeglasses are needed for this person to see distant objects clearly? Assume that the lens distance is 2 cm from the eye.

b) What will be the near point for the person with this vision correction?

c) If the same person were to wear corrective contact lenses, what focal length and lens power would be needed for this person to see distant objects clearly?

d) What will be the near point for the person with this vision correction?