

Problem Set 3
due Feb. 14, 2003

Reading assignment: Giancoli, chapter 34.

1. (Variant of Giancoli prob. 4): A stamp collector uses a converging lens with focal length of 24 cm to view a stamp 12 cm in front of the lens.
(a) Where is the image located? (b) What is its magnification?
2. (variant of Giancoli 11) An object a distance d in front of a certain lens is imaged at a position that is $d/4$ in front of the lens (on the same side as the object). What type of lens is this and what is its focal length in terms of d ? If the image were located $5/4 d$ in front of the lens (i.e. on the same side as the object), what type of lens would it be and what focal length would it have?
3. (variant of Giancoli 14) How far apart are an object and an image formed by a 60 cm focal length converging lens if the image is $2 \times$ larger than the object and is real?
4. (variant of Giancoli 17) Two converging lenses with the same focal length f are placed a distance $f/2$ apart. An object is placed a distance $4f/3$ in front of one. Where will the final image formed by the second lens be located in terms of f ? What is the total magnification?
5. Giancoli 28.
6. (variant of Giancoli 46) What is the magnification of a lens used with a relaxed eye which is farsighted, i.e. with near point 50 cm, if the lens focal length is 10 cm? What is the magnification if the image is at the "near point" for this person's eye?
7. (variant of Giancoli 77) A lucite planoconvex lens (Fig. 34-1a) has one flat surface and one with $R = 18.4$ cm. It is used to view an object located 50.0 cm away from the lens, which is a mixture of red and

yellow. The index of refraction of the lucite is 1.5106 for red light and 1.5226 for yellow light. What are the locations of the red and yellow images formed by the lens?

8. (variant of Giancoli 79) In a slide or movie projector, the film acts as the object whose image is projected on a screen (fig 34-41). If a 100 mm focal length lens is to project an image on a screen 10 m away, how far from the lens should the slide be? If the slide is 36 mm wide, how wide will the picture be on the screen?
9. (variant of Giancoli 80) A converging lens with focal length of 10.0 cm is placed in contact with a diverging lens with a focal length of 20.cm. What is the focal length of the combination, and is the combination converging or diverging?
10. Giancoli 84.

Please show your work so that the grader can give you credit for effort even if you get the wrong answer. For keeping track of your own work it is usually helpful to only plug in numbers at the end. Also, please try to make your work readable!