Homework Solutions
11/15/2007

Conceptual Questions

8. A flat mirror does not shift left and right. The left hand would appear on the left side and the right hand would appear on the right side.

Problems

5.

$$\frac{1}{p}+\frac{1}{q}=\frac{1}{f}$$

$$\frac{1}{10.0m}+\frac{1}{q}=\frac{1}{-0.275m}$$

$$\frac{1}{q}=-\frac{1}{0.275m}-\frac{1}{10.0m}$$

$$q=-0.268$$

$$M=-\frac{q}{p}=-\frac{-0.268m}{10.0m}=0.0268$$

The image is virtual and located 0.268 m behind the mirror. Since M>1, the image is upright and smaller.

10. We can conclude that Dina is looking in a concave mirror because a convex mirror will only form virtual upright images of real objects. Furthermore, the focal length of the mirror is approximately 30 cm because this is the location where no image is formed. The radius of curvature must therefore be 60 cm.

11.

$$M=-\frac{q}{p}=\frac{h'}{h}=\frac{5.00cm}{2.00cm}=+2.50$$

$$-\frac{q}{p} = +2.50$$

$$q = -2.50p$$

$$q = -2.50(3.00cm) = -7.50cm$$

$$\frac{1}{p} + \frac{1}{q} = \frac{1}{f}$$

$$\frac{1}{3.00cm} + \frac{1}{-7.50cm} = \frac{1}{f}$$

$$f = 5.00cm$$

50.

$$\frac{1}{12.5cm} + \frac{1}{q_1} = \frac{1}{10.0cm}$$

$$\frac{1}{q_1} = \frac{1}{10.0cm} - \frac{1}{12.5cm}$$

$$q_1 = 50.0cm$$

$$p_2 = 25.0cm - 50.0cm = -25.0cm$$

$$\frac{1}{-25.0cm} + \frac{1}{q_2} = \frac{1}{-16.7cm}$$

$$\frac{1}{q_2} = \frac{1}{-16.7cm} + \frac{1}{25.0cm}$$

$$q_2 = -50.3cm$$

$$M = \left(-\frac{50.0cm}{12.5cm}\right)\left(-\frac{-50.3cm}{-25.0cm}\right) = +8.05$$

The image is virtual because q2<0 and upright because M>0. The image is 25.3 cm behind the mirror.