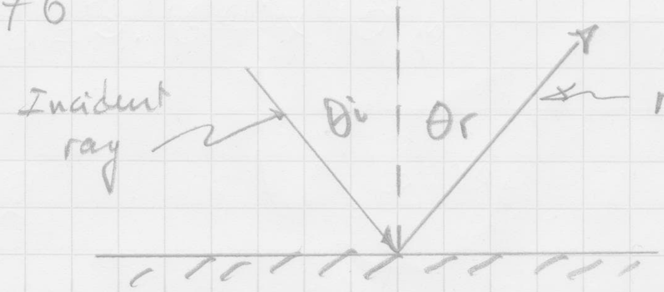
Practice Makes Perfect
Ch. 2.

Dr. Bob

p. 76

1.




The angle of incidence equals the angle of reflection, $\theta_i = \theta_r$. These are measured between ray and the normal.

2.

a. As the center of curvature move further from the vertex, the focal point will also move further from the vertex, and the relationship $f = \frac{R}{2}$ will still apply throughout.

b. The focal length will tend towards infinity as the mirror becomes flat. A flat mirror would have an infinite focal length.

c. The mirror would be a flat planar mirror when f becomes infinite.

3.

a. M1 is a plane mirror
M2 is a convex mirror

b. The ray would pass through point B, since the angle of reflection is equal to the angle of incidence.

P. 76

4.

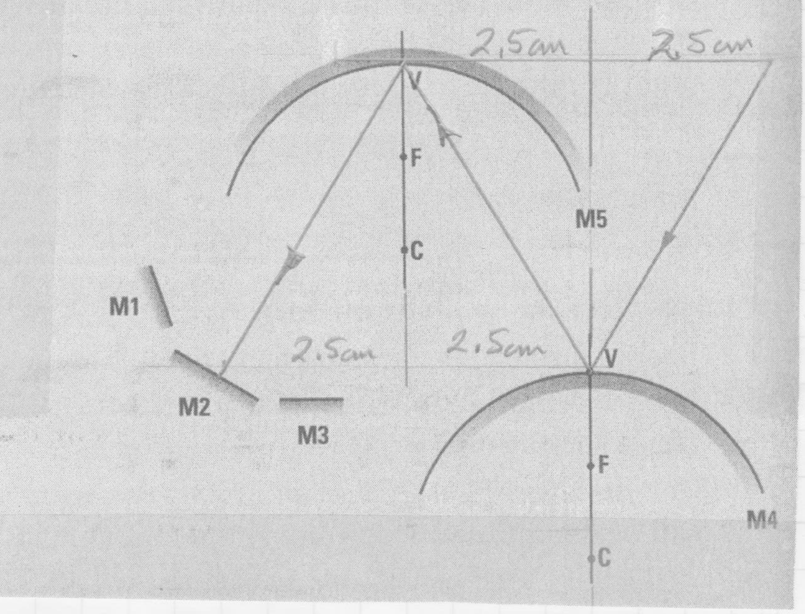
The first reflection has an error. Using a protractor I measure $\theta_i \simeq 33^\circ$ & $\theta_r \simeq 22^\circ$, $\theta_i$ must equal $\theta_r$

The second reflection at M2 is okay. $\theta_i = \theta_r \cong 20^\circ$

The third reflection at M3 is okay. It is like 2nd principle ray passing through the focal point and leaving parallel to the principle axis.

5.

**5.** In the following diagram, which mirror (M1, M2 or M3) will the ray strike after it is reflected by mirrors M4 and M5?




On spherical mirrors, the rays reflect such that $\theta_i = \theta_r$. At the vertex, V, the normal is the principle axis. Using triangles I can determine the path of the ray.

This ray will strike mirror, M2.

6. Since the room is reflected in the mirror, it gives impression of a larger room. The reflected virtual room gives the impression of greater depth.

7. When the person is far, their image is real, inverted, and smaller

When they reach the center of curvature, their image is real, inverted, & same size.

Between the center of curvature and the focal point their image is real, inverted & larger

At their focal point, there is no image.

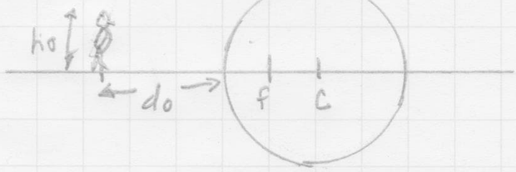
Between the focal point & the vertex, their image is virtual, upright, & larger.

8. The image disappears when the person is at the focal point of the spoon. The rays from any point on the person would leave the spoon parallel and never form an image.

9. $f = -20\text{cm} = -0.20\text{m}$ (convex mirror)

$h_o = 25\text{ cm} = 0.25\text{ m}$

$d_o = 50\text{cm} = 0.50\text{m}$




$d_i = ?$
$h_i = ?$

$$\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o}$$

$$d_i = \left(\frac{1}{f} - \frac{1}{d_o}\right)^{-1} = \left(\frac{-1}{0.20\text{m}} - \frac{1}{0.50\text{m}}\right)^{-1}$$

$$= \left(\frac{-5-2}{1.00\text{m}}\right)^{-1} = \left(\frac{-7}{1.00\text{m}}\right)^{-1}$$

$$d_i = \frac{-1.00\text{m}}{7} ; \; d_i = -0.14\text{m}$$

$$\boxed{d_i = -14\text{cm}}$$

$$\frac{h_i}{h_o} = \frac{-d_i}{d_o} ; \; h_i = \frac{-d_i}{d_o} h_o ;$$

$$h_i = -\left(\frac{-14\text{cm}}{50\text{cm}}\right) 25\text{cm} \quad h_i = 7.14\text{cm}$$

$$\boxed{h_i = 7.1\text{cm}}$$