Practice Problems

1. A convex mirror has a focal length of −0.90 m. An object with a height of 0.40 m is 2.5 m from the mirror.
   a. Calculate the image distance.
   b. Calculate the image height.

a) $f = -0.9$ $h_o = 0.4m$ $d_o = 2.5m$

$R = d_i$

A: $\frac{1}{d_i} = \frac{1}{f} - \frac{1}{d_o}$

$\frac{1}{d_i} = \frac{1}{-0.9} - \frac{1}{2.5}$

$\frac{1}{d_i} = \frac{-2.5 - 0.9}{2.25}$

$\frac{1}{d_i} = \frac{-3.4}{2.25}$

$d_i = \frac{-2.25}{3.4} = -0.6618\ m$

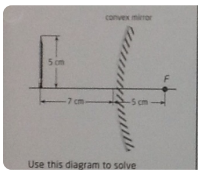
b) $\frac{h_i}{h_o} = \frac{-d_i}{d_o}$

$\frac{h_i}{0.4m} = \frac{-(-0.6618m)}{2.5m}$

$h_i = \frac{0.4 \times 0.6618}{2.5}$

$h_i = 0.106\ m$

S



Use this diagram to solve

1. A convex mirror has a focal length of −0.90 m. An obj a height of 0.40 m is 2.5 m from the mirror.
   a. Calculate the image distance.
   b. Calculate the image height.
2. Use the data in the diagram on the left to answer the questions below.
   a. Calculate the image distance.
   b. Calculate the image height of the image.

2a) G- $f = -5cm$ $d_o = 7cm$ $h_o = 5cm$

$R = d_i$

A- $\frac{1}{d_i} = \frac{1}{f} - \frac{1}{d_o}$

$\frac{1}{d_i} = \frac{1}{-5} - \frac{1}{7}$

$\frac{1}{d_i} = \frac{-7 - 5}{35}$

$\frac{1}{d_i} = \frac{-12}{35}$

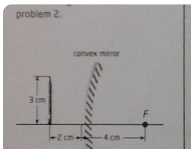
$d_i = \frac{35}{12} = -2.92\ cm$

2b) $\frac{h_i}{h_o} = \frac{-d_i}{d_o}$

$\frac{h_i}{5} = \frac{-(-2.92)}{7}$

$h_i = \frac{5 \times 2.92}{7}$

$h_i = 2.086\ cm$



Use this diagram to solve problem 3.

3. Use the data in the diagram on the left to answer the questions below.
   a. Calculate the image distance.
   b. Calculate the image height.
4. A convex security mirror in a warehouse has a focal lengt −0.50 m. A forklift, which is 2.2 m tall, is 6.0 m from the
   a. Calculate the image distance.
   b. Calculate the image height.
5. A convex security mirror has a focal length of −0.25 m. A person with a height of 1.5 m is 4.0 m from the mirror.
   a. Calculate the image distance.

$R = d_i$

G= $f = -4cm$; $d_o = 2cm$; $h_o = 3cm$

A: $\frac{1}{d_i} = \frac{1}{f} - \frac{1}{d_o}$

S- $\frac{1}{d_i} = \frac{1}{-4} - \frac{1}{2}$

$\frac{1}{d_i} = \frac{-2 - 1}{4}$

$\frac{1}{d_i} = \frac{-3}{4}$

$d_i = -4/3 = -1.33\ cm$

3b) $h_i = \frac{h_o \times -d_i}{d_o}$

$h_i = \frac{3 \times -(-1.33)}{2}$

$= 1.995\ cm$

4. A convex security mirror in a warehouse has a focal length of −0.50 m. A forklift, which is 2.2 m tall, is 6.0 m from the mirror.

a. Calculate the image distance.

b. Calculate the image height.

G- $f = -0.5\,m$ $h_o = 2.2\,m$ $d_o = 6\,m$

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

$$\frac{1}{d_i} = \frac{1}{-.5} - \frac{1}{6}$$

$$\frac{1}{d_i} = \frac{-6 - 0.5}{3}$$

$$\frac{1}{d_i} = \frac{-6.5}{3}$$

$$d_i = -\frac{3}{6.5}$$

$$d_i = -0.4615\ m$$

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

$$= \frac{2.2 \times 0.4615}{6}$$

$$= 0.169\ m$$

5. A convex security mirror has a focal length of −0.25 m. A person with a height of 1.5 m is 4.0 m from the mirror.

a. Calculate the image distance.

b. Calculate the image height.

6. An object 0.4 m tall is placed 2.5 m in front of a convex mirror that has a focal length of –90 cm.

a. Calculate the image distance.

b. Calculate the image height.

7. An object 25 cm tall is placed 80 cm in front of a convex mirror that has a radius of curvature of 1.5 m.

a. Calculate the image distance.

b. Calculate the image height.

7b) $h_i = \frac{h_o \times -d_i}{d_o}$

$= \frac{25 \times 38.7}{80}$

$= 12.09\ cm$

G- $h_o = 25\ cm$ $d_o = 80\ cm$ ~~$f = 0.75\ m \rightarrow 75\ cm$~~

$C = 2f$ $f = \frac{C}{2}$

$\frac{1}{d_i} = \frac{1}{-75} - \frac{1}{80}$

$\frac{1}{d_i} = \frac{-80 - 75}{6000}$

$d_i = \frac{6000}{-155}$

$d_i = -38.7\ cm$