

Chapter 13- Optics

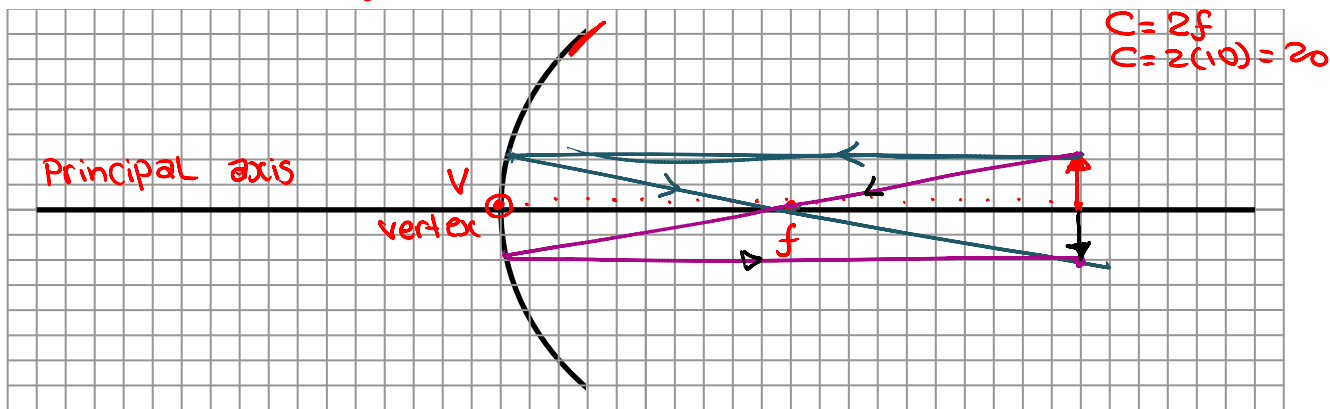
13.2-Image Formation with Lenses
Curved Mirror In-class assignment

- 1) A concave mirror has a focal length of 10.0 cm. An object 2.00 cm tall is placed 20.0 cm in front of the mirror. (A) Find where the image appears using equations. (B) Find the size of the image using equations. (C) Ray trace the image on the graph paper below.

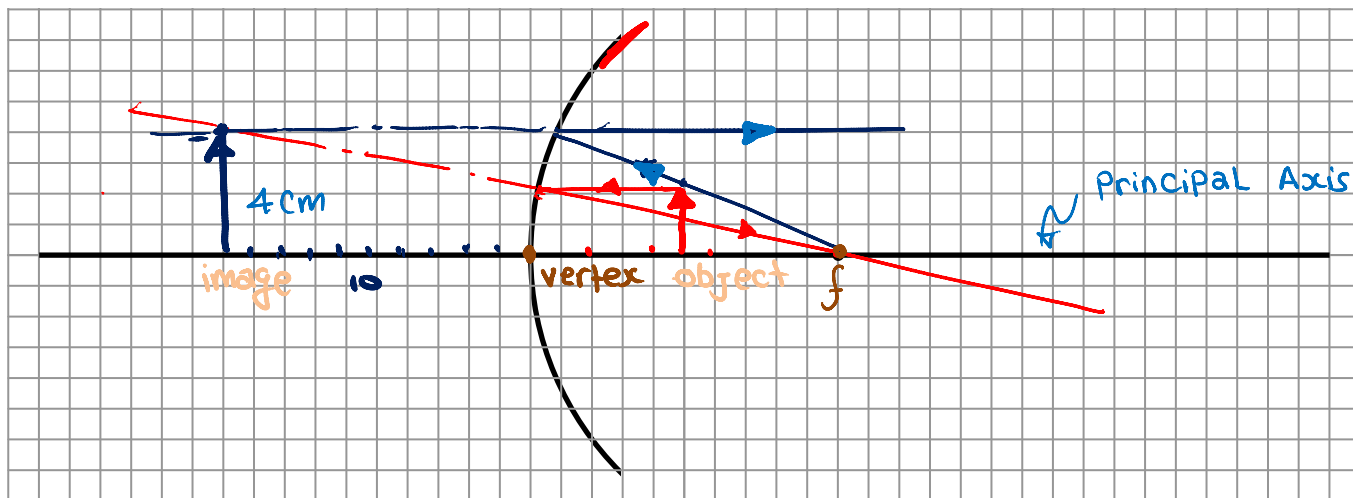
$f = 10 \text{ cm}$
 $h_o = 2.00 \text{ cm}$
 $d_o = 20. \text{ cm}$
 $d_i = ?$

(a) $\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$
 $\frac{1}{d_i} = \frac{1}{f} - \frac{1}{d_o} = \frac{d_o - f}{f \cdot d_o}$
 $d_i = \frac{d_o \cdot f}{d_o - f} = \frac{(20)(10)}{20 - 10} = \boxed{20 \text{ cm}}$

(b) $M = \frac{h_i}{h_o} = \frac{-d_i}{d_o}$
 $h_i = \frac{h_o \cdot (-d_i)}{d_o} = -h_o$
 $h_i = -2.00 \text{ cm} \rightarrow \text{(inverted)}$



- 2) A concave mirror has a focal length of 10.0 cm. An object 2.00 cm tall is placed 5.00 cm in front of the mirror. (A) Find where the image appears using equations. (B) Find the size of the image using equations. (C) Ray trace the image on the graph paper below.



$f = -10 \Rightarrow$ Convex mirror.

- 3) A convex mirror has a focal length of 10.0 cm. An object 2.00 cm tall is placed 5.00 cm in front of the mirror. (A) Find where the image appears using equations. (B) Find the size of the image using equations. (C) Ray trace the image on the graph paper below.

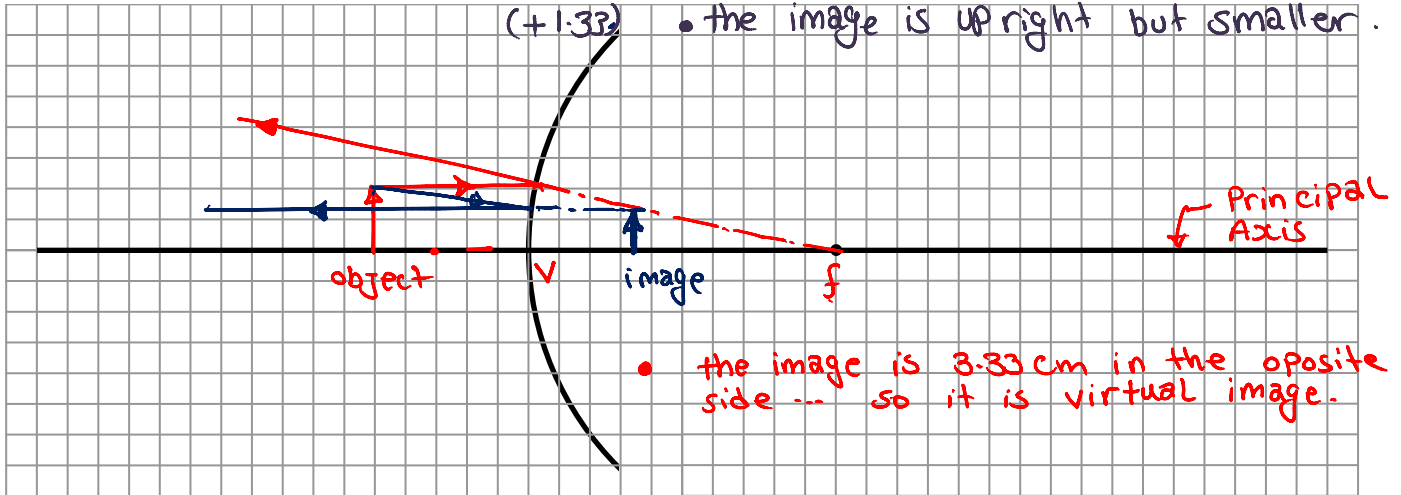
$f = -10 \text{ cm}$
 $h_o = 2.0 \text{ cm}$
 $d_o = 5.0 \text{ cm}$

$d_i = \frac{f \cdot d_o}{d_o - f} = \frac{(-10)(5)}{5 - (-10)} = \frac{-50}{15} \dots$

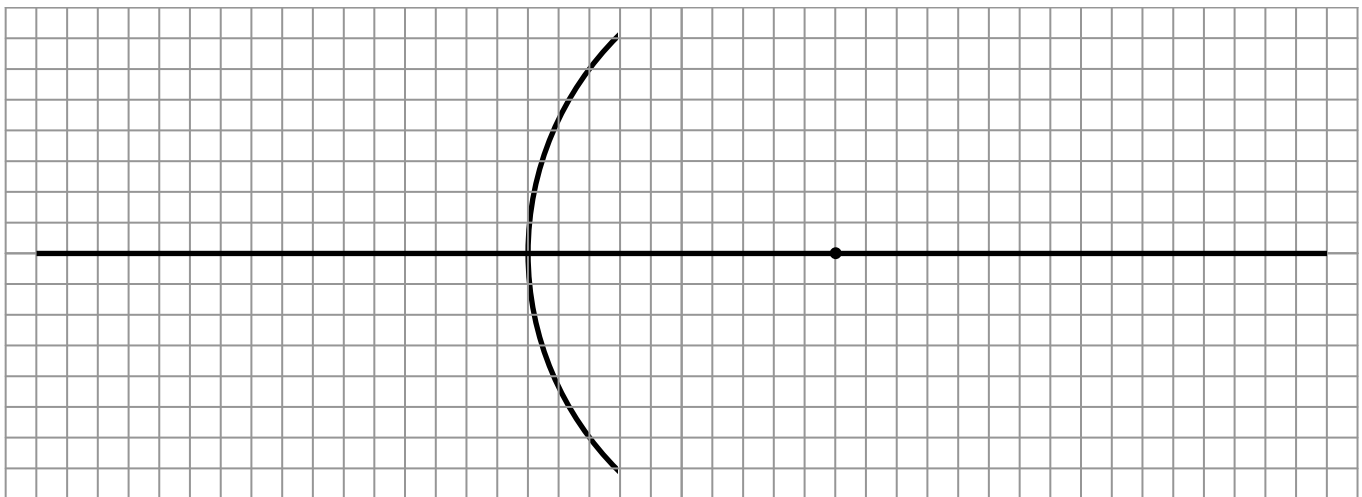
$\frac{h_i}{h_o} = -\frac{d_i}{d_o} \quad h_i = \frac{(-2.0)(-3.33)}{5.0} = \boxed{1.33 \text{ cm}}$

(-3.33 cm) • the image in the opposite side of the object

(+1.33) • the image is upright but smaller.



- 4) A dentist's mirror is placed 2.0 cm from a tooth. The enlarged image is located 5.6 cm behind the mirror.
- What kind of mirror is being used (plane, concave or convex)?
 - Is the image upright or inverted? Is the image real or virtual?
 - Find the focal length of the mirror.
 - Find the magnification.
 - Sketch the situation below (you will want to change the location of the focus).

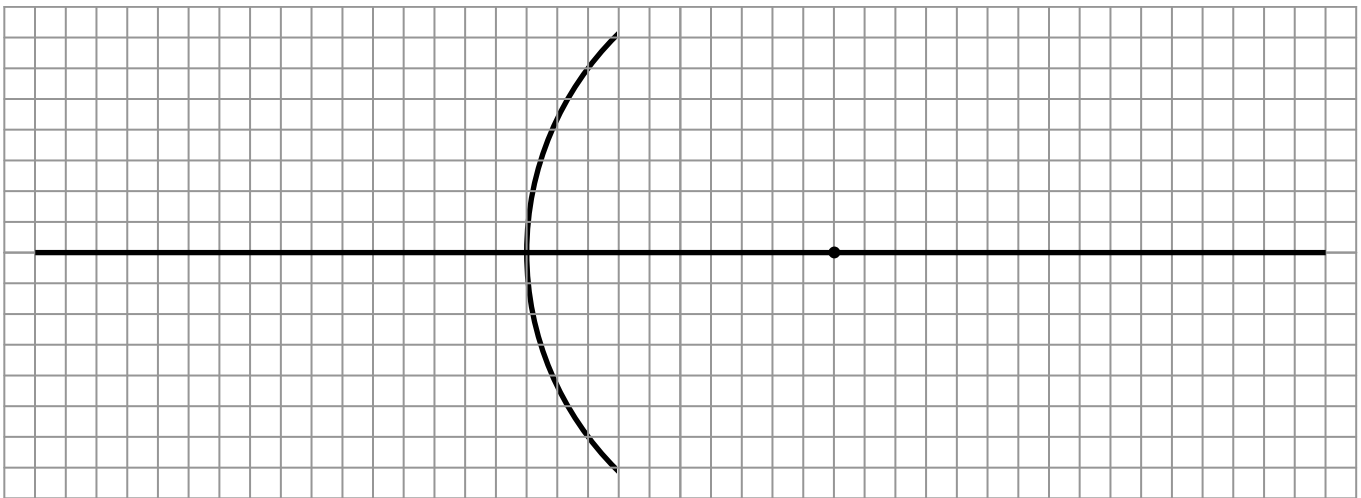


5) A convex mirror has a radius of curvature of 40.0 cm. An image of height 3.00 cm is found 10.0 cm from the mirror.

- a) Is the image in front of or behind the mirror?
- b) Is the image real or virtual? Is the image upright or inverted?
- c) Is the image smaller or larger than the object?
- d) Find the object location.

e) Find the object size.

g) Sketch the situation below. (You will need to consider an appropriate scale)



- 6) An object is placed 15.0 cm in front of a mirror. The magnification is -2.00.
- a) What kind of mirror is being used (plane, concave or convex)?
 - b) Is the image real or virtual? Upright or inverted?
 - c) Find the radius of curvature of the mirror.

d) Sketch the situation below.

