H.W. Solution Chapter 34 Phys 201
Term 112.

34.2

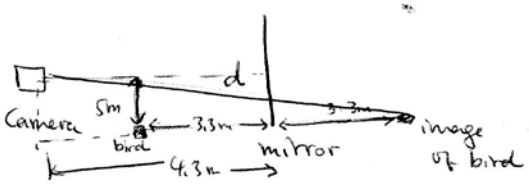
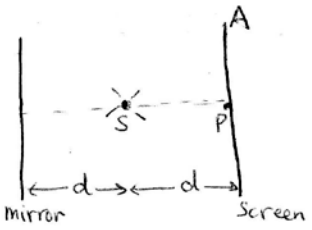


Figure not to scale.

$$d^2 = 7.6^2 + 5^2$$

$$\boxed{d = 9.09\ m}$$

34.4



$$I_p = \frac{P_s}{4\pi d^2}$$

$$I_2 = \frac{P_s}{4\pi d^2} + \frac{P_s}{4\pi (3d)^2}$$

$$= \frac{P_s}{4\pi d^2}\left(1 + \frac{1}{9}\right) = \boxed{\frac{10}{9} I_p}$$

34.18

Graph of m vs. P

when $m = 0.5$ $\quad p = 10$ cm

$$m = -\frac{i}{p} \Rightarrow i = -5 \text{ cm}$$

$$\frac{1}{f} = \frac{1}{p} + \frac{1}{i} = \frac{1}{10} + \frac{1}{-5} = -\frac{1}{10}$$

$$\Rightarrow f = -10 \text{ cm} = \text{Constant}$$

$p = 21$ cm $\quad \frac{1}{-10} = \frac{1}{21} + \frac{1}{i} \Rightarrow i = -6.77$ cm

$$m = -\frac{i}{p} = -\frac{-6.77}{21} = \boxed{0.32}$$

34.32

$n_1 = 1.6$ $\quad R = 5.0$ cm

$h = 3.0$ cm $\quad d = 8.0$ cm

use equation 34.8 $\quad \frac{n_1}{p} + \frac{n_2}{i} = \frac{n_2 - n_1}{r}$

$$\frac{1.6}{\underset{3\text{cm}}{=p}} + \frac{1}{i} = \frac{1 - 1.6}{r = -5\text{cm}}$$ (the object faces a concave surface)

we are looking for i !

$$\frac{1.6}{3} + \frac{1}{i} = \frac{-0.6}{-5} \Rightarrow \boxed{i = -2.4\text{ cm}}$$

The observer will see the table top at a distance of 7.4 cm

34.36

$n_1 = 1$ $\quad n_2 = 1.5$ $\quad p = +10$ cm $\quad r = +30$ cm

$$\frac{1}{10} + \frac{1.5}{i} = \frac{1.5 - 1}{30} \Rightarrow \boxed{i = -18\text{cm}}$$

$i < 0$ the image is virtual

the object and the image are in the same side.

34.40

$n_1 = 1.5$ $\quad n_2 = 1$ $\quad p = ?$ $\quad r = -30$cm $\quad i = -7.5$cm

$$\frac{1.5}{p} + \frac{1}{i} = \frac{1 - 1.5}{r}$$

$$\frac{1.5}{p} + \frac{1}{-7.5} = \frac{1 - 1.5}{-30} \Rightarrow \boxed{p = +10\text{cm}}$$

$i < 0$ image is virtual. The object and image are on the same side.

34.42

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

From the graph at $p = 30$ $\quad i \to \infty \Rightarrow \frac{1}{p} = \frac{1}{f} \Rightarrow p = f = 30\,cm$

$\boxed{f = 30\,cm}$ = Constant

use the equation again $\frac{1}{100} + \frac{1}{i} = \frac{1}{30} \Rightarrow \boxed{i = +42.8\,cm}$

34.58

a) $m = -0.5 = -\frac{i}{p} \Rightarrow i = 0.5p > 0$ $\boxed{\text{convex}}$ lens. and image is real

b) From the figure $p + i = d$

$p + 0.5p = d \Rightarrow p = \frac{d}{1.5} = \boxed{26.7\,cm}$

c) $\frac{1}{f} = \frac{1}{i} + \frac{1}{p}$

$\frac{1}{f} = \frac{1}{13.3} + \frac{1}{26.7} \Rightarrow \boxed{f = 8.89\,cm}$

34.50

$p = +10\,cm$ Diverging lens (concave) $f = -6\,cm$

a) $\frac{1}{f} = \frac{1}{i} + \frac{1}{p} \Rightarrow \frac{1}{i} = \frac{1}{f} - \frac{1}{p} \Rightarrow \boxed{i = -3.75\,cm}$

b) $m = -\frac{i}{p} = \boxed{0.375}$

c) the image is virtual since $i < 0$

d) It is Non inverted since $m > 0$

e) It is on the same side as the object and always true for concave lens !!!

34.54 $p = +12\,cm$ Diverging lens $f = -31\,cm$

a) $\frac{1}{f} = \frac{1}{p} + \frac{1}{i} \Rightarrow \frac{1}{i} = \frac{1}{-31} - \frac{1}{12} \Rightarrow \boxed{i = -8.7\,cm}$

b) $m = -\frac{i}{p} = \boxed{+0.73}$

c) $i < 0 \Rightarrow$ image is virtual

d) $m > 0 \Rightarrow$ non inverted

e) image on the same side as the object.