The image you is due to

(a) a convex mirror b) a planar mirror (c) a concave mirror

Figure 34-95 Physics for Engineers and Scientists 3/e
Bo Zaunders/Corbis.

The image we see of the five is due to
(a) convex mirror (b) concave mirror (c) planar mirror

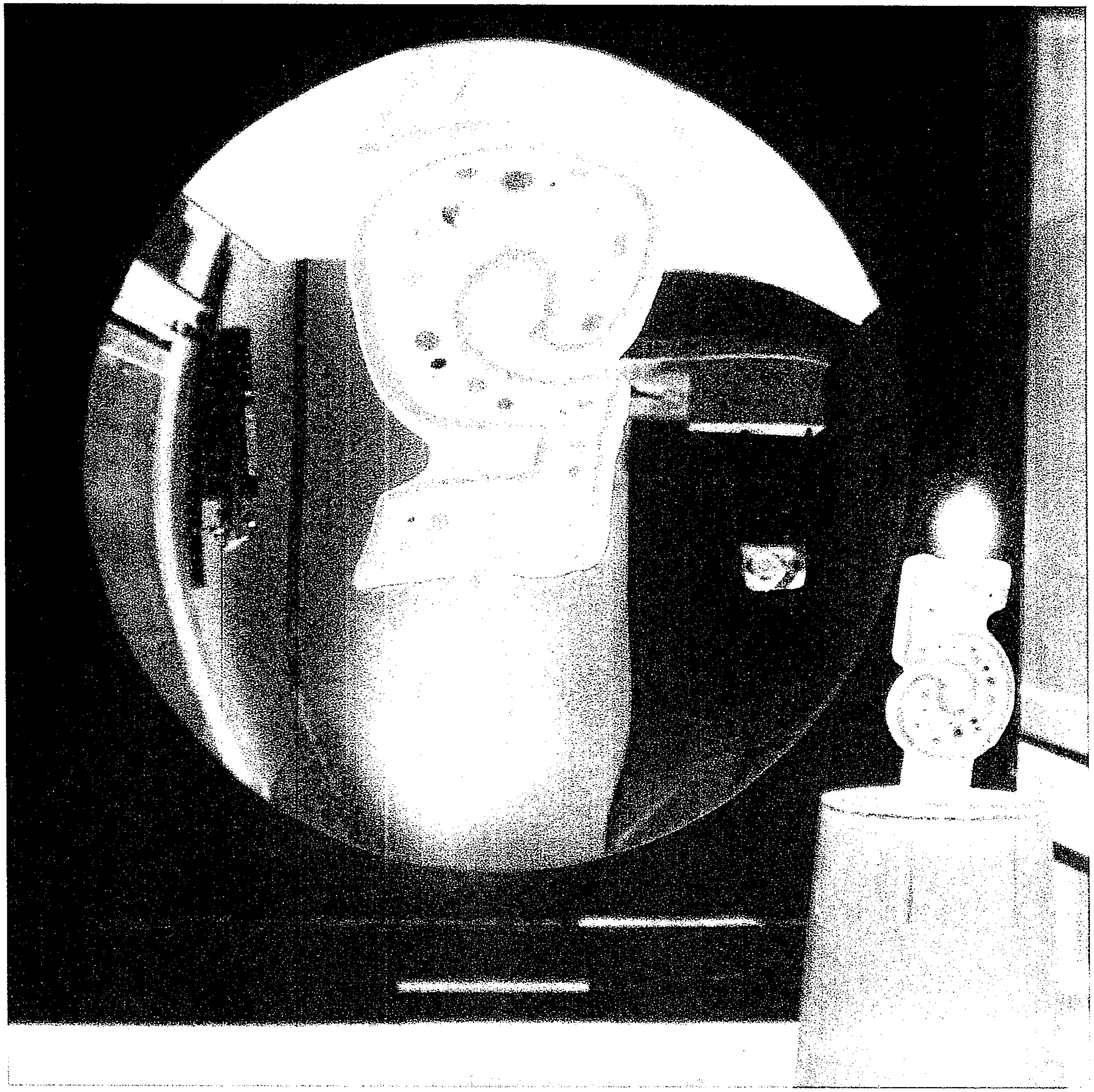


Figure 34-41b Physics for Engineers and Scientists 3/e
Courtesy of John Markert

The image you see is
(a) virtual (b) real (c) indetermined

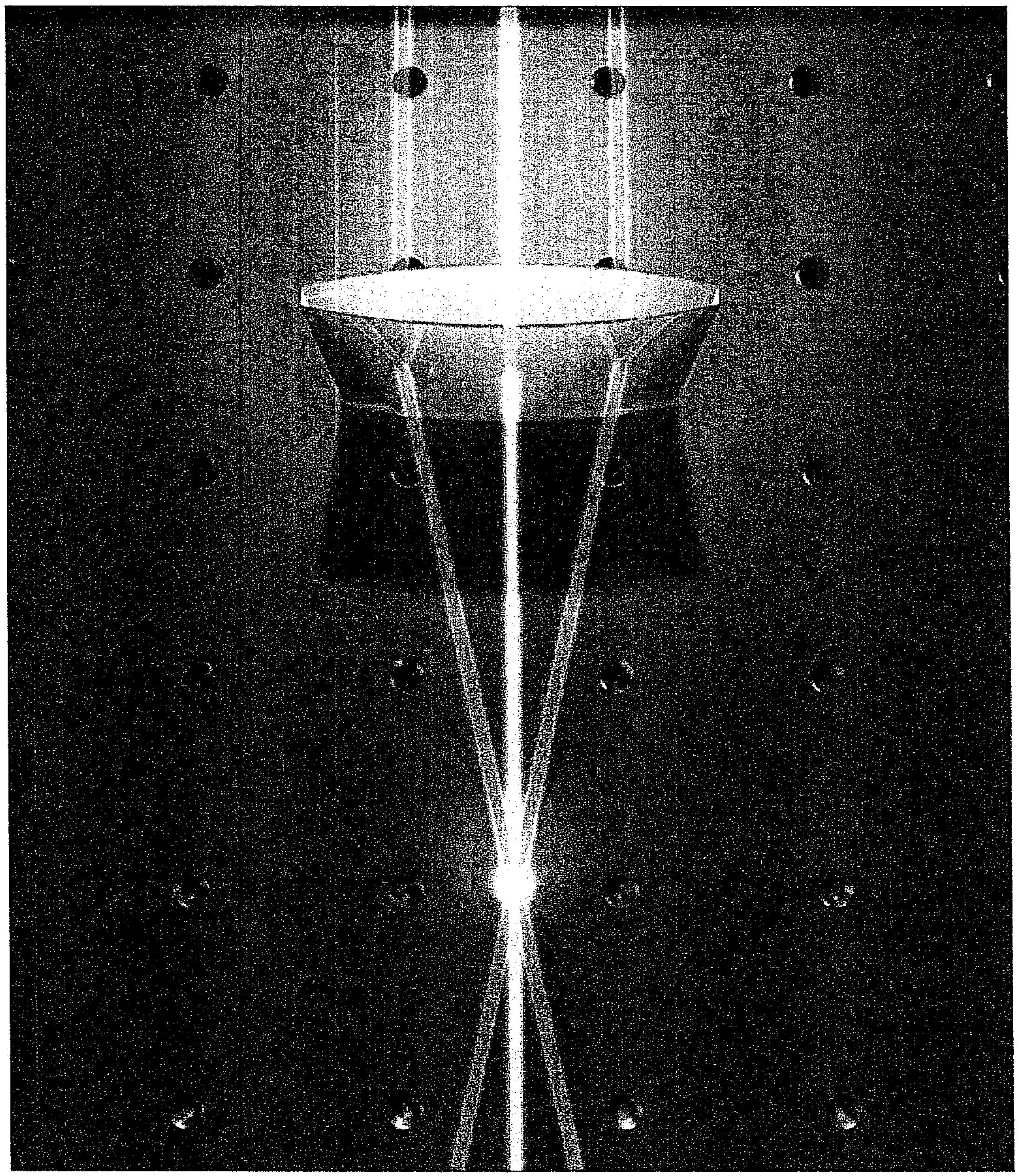


Figure 34-43b Physics for Engineers and Scientists 3/e
David Parker/Photo Researchers, Inc.

lens maker equation

$$\frac{1}{F} = (n-1)\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$$

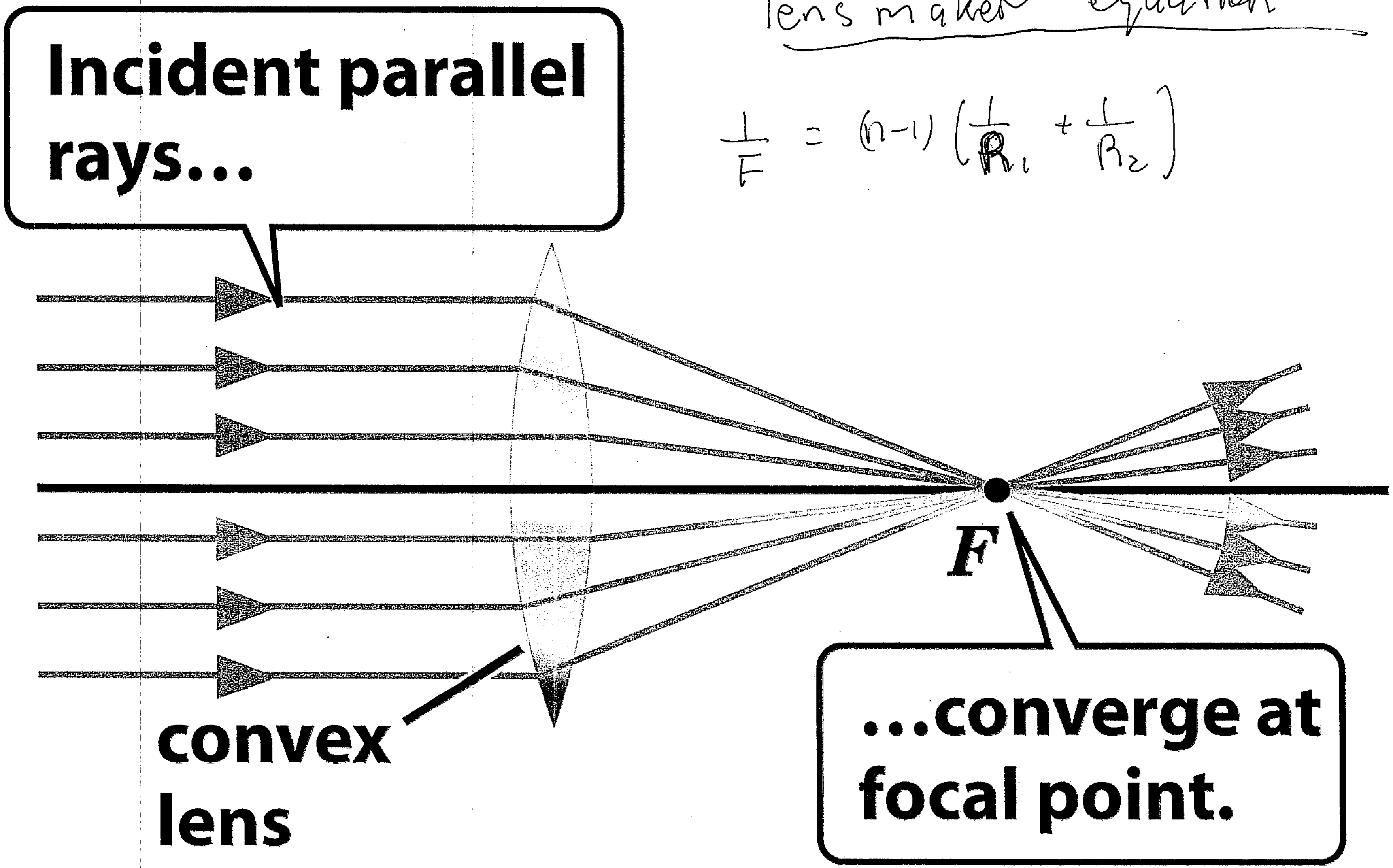


Figure 34-43a Physics for Engineers and Scientists 3/e

$$\frac{1}{s} + \frac{1}{s'} = \frac{1}{f}$$

$$f = (n-1)\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$$

here: $R_1 < 0$
$R_2 < 0$

$s' < 0$

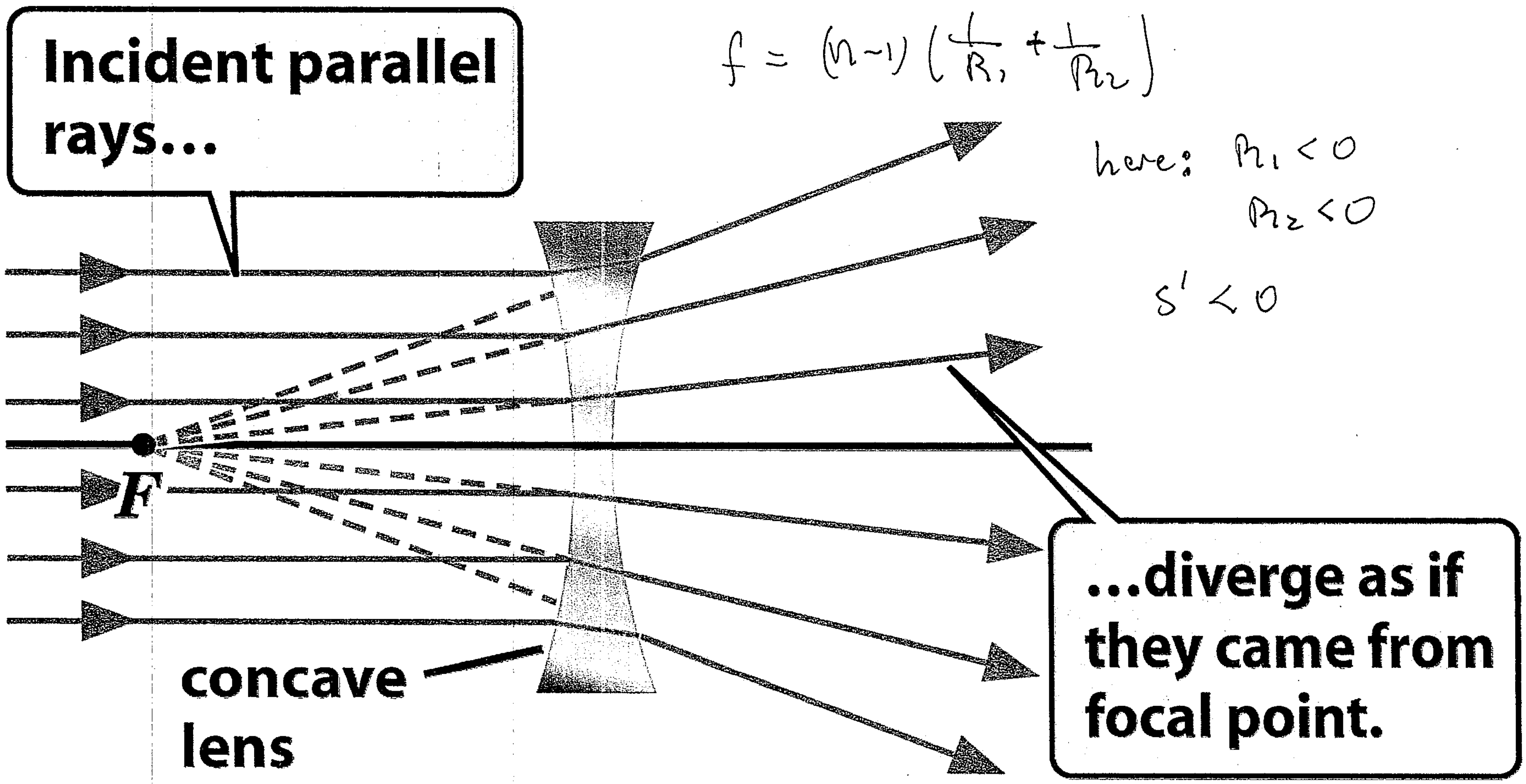


Figure 34-44a Physics for Engineers and Scientists 3/e

MIRROR AND LENS EQUATION

But there is a difference in notation between mirror and lens

$$\frac{1}{s}+\frac{1}{s'}=\frac{1}{f}; \quad M=\frac{-s'}{s}$$

$M \equiv \frac{h'}{h} = -\frac{s'}{s}$

<u>MIRROR</u>; s > 0 on left;

<u>real image</u> (inverted)

s' > 0, s' on left

f = R/2 > 0, converging concave mirror

<u>virtual upright image</u>

<u>s' < 0 on right</u>

f = R/2 < 0, diverging convex mirror

<u>LENS;</u> s > 0 on left

<u>real image</u> (inverted)

s' > 0, s' on right

$1/f = (n-1)(1/R_1+1/R_2) > 0$, converging convex lens

<u>virtual upright image</u>

<u>s' < 0, on left</u>

$1/f = (n-1)(1/R_1+1/R_2) < 0$, diverging concave ~~mirror~~ lens

$\frac{1}{f} = (n-1)\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$

here $R_1 < 0$, $R_2 > 0$

$\frac{1}{R_2} > \frac{1}{R_1}$ ∴ focusing

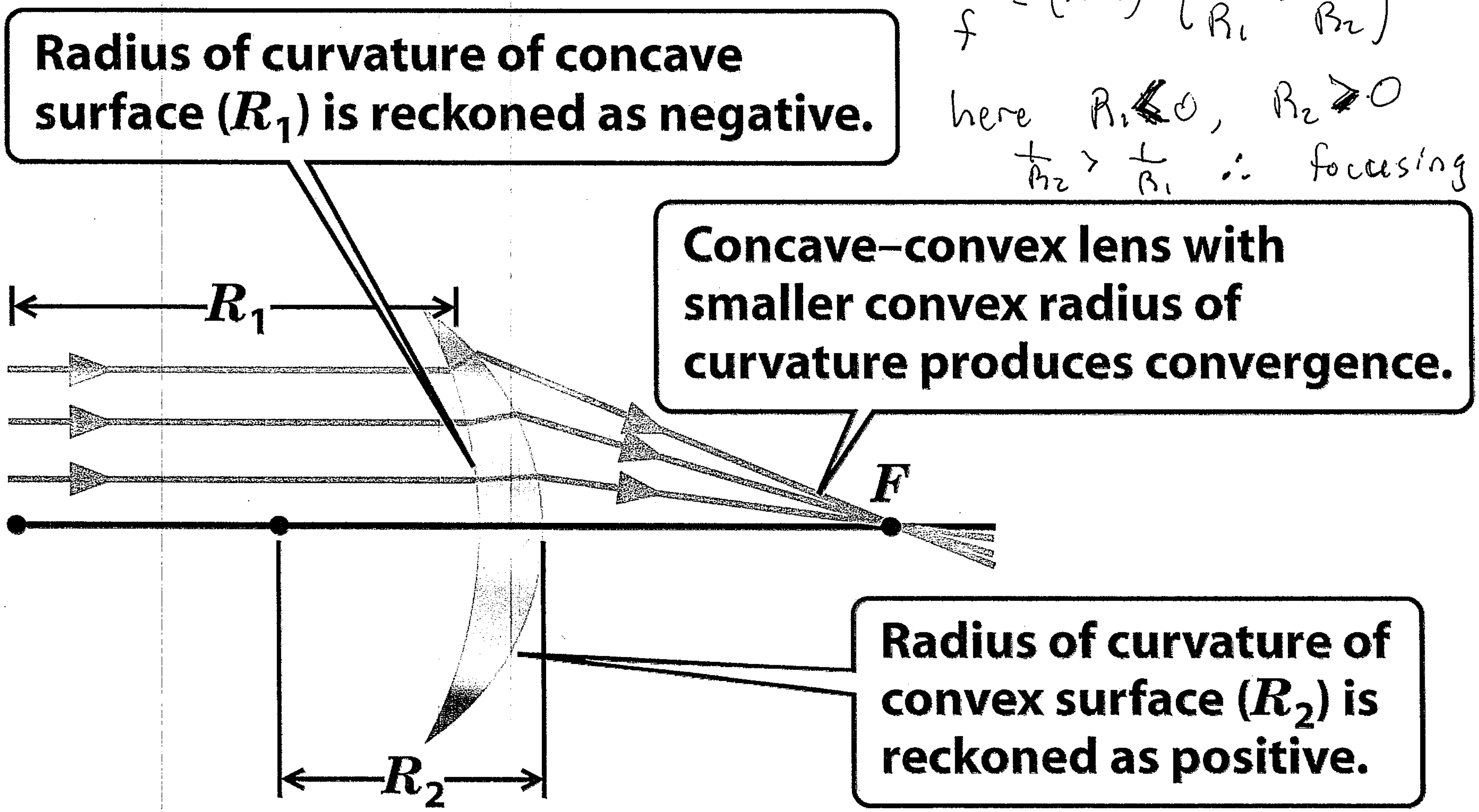


Figure 34-45a Physics for Engineers and Scientists 3/e

$$\frac{1}{f} = (n-1)\left(\frac{-1}{|R_1|} + \frac{1}{R_2}\right)$$

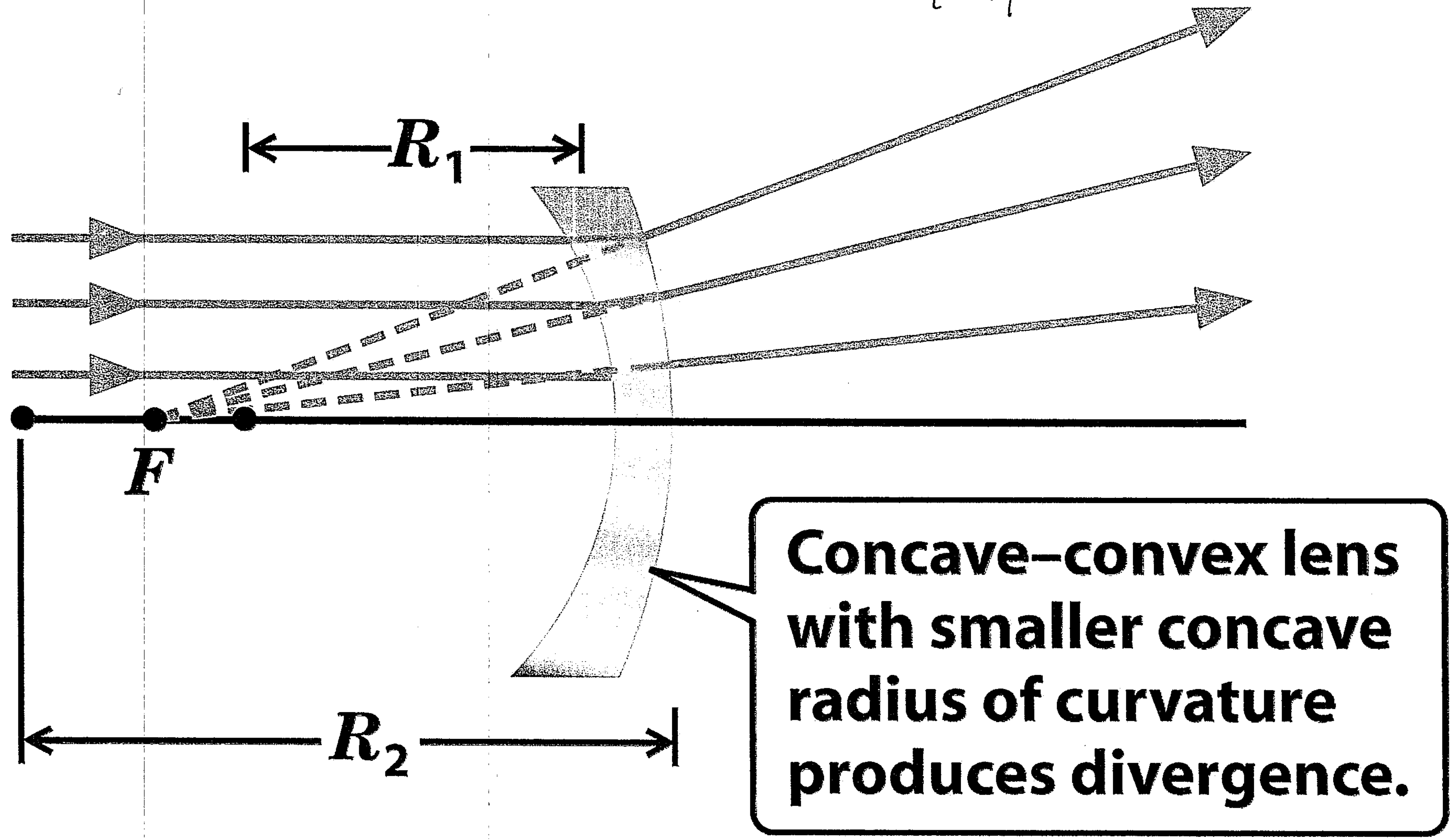


Figure 34-45b Physics for Engineers and Scientists 3/e

Formation of Inverted Image

$|F'| = |F|$

$|P| > 2|F|$

$F < |P'| < 2F$

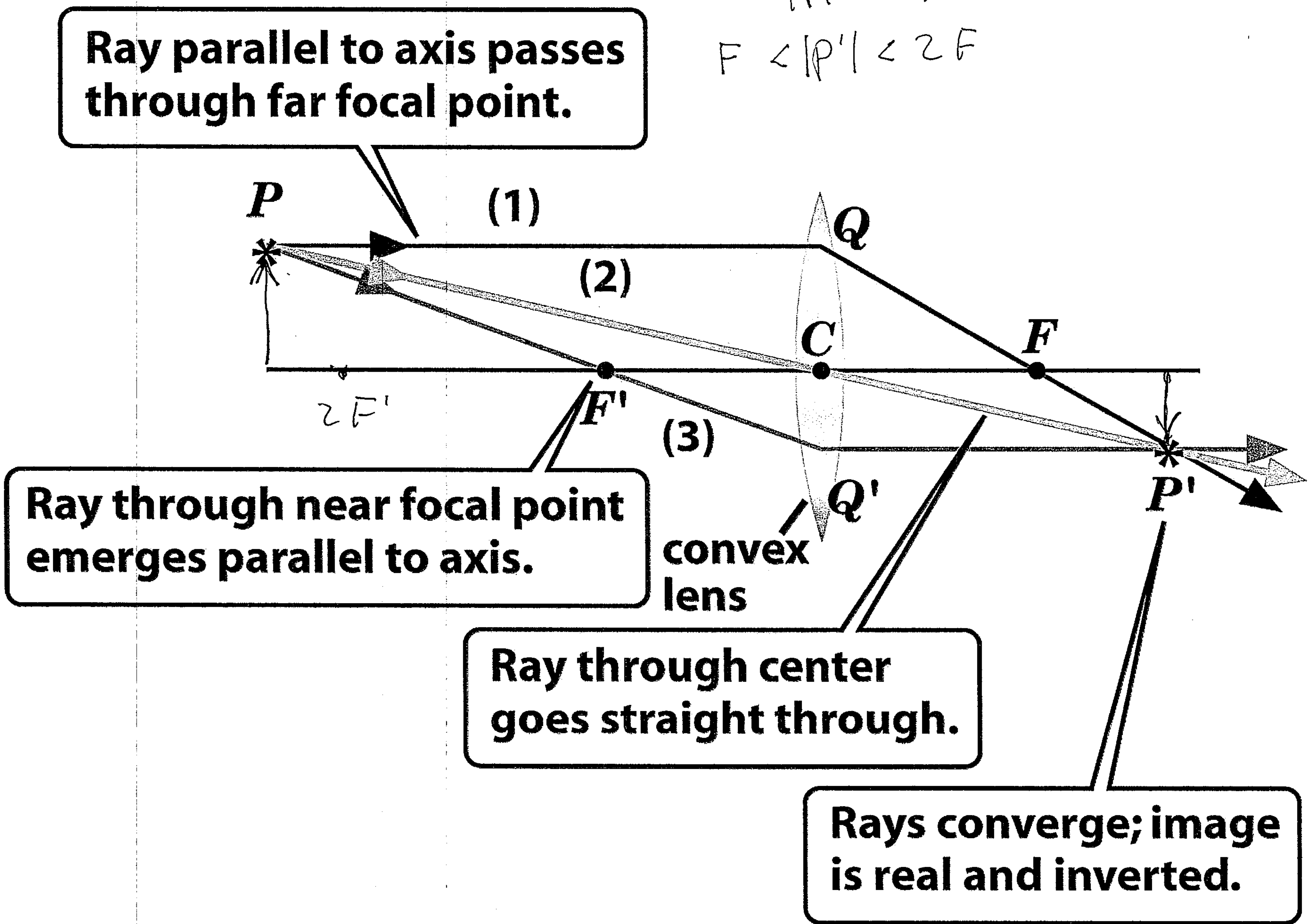


Figure 34-46 Physics for Engineers and Scientists 3/e

Formation of reduced upright image

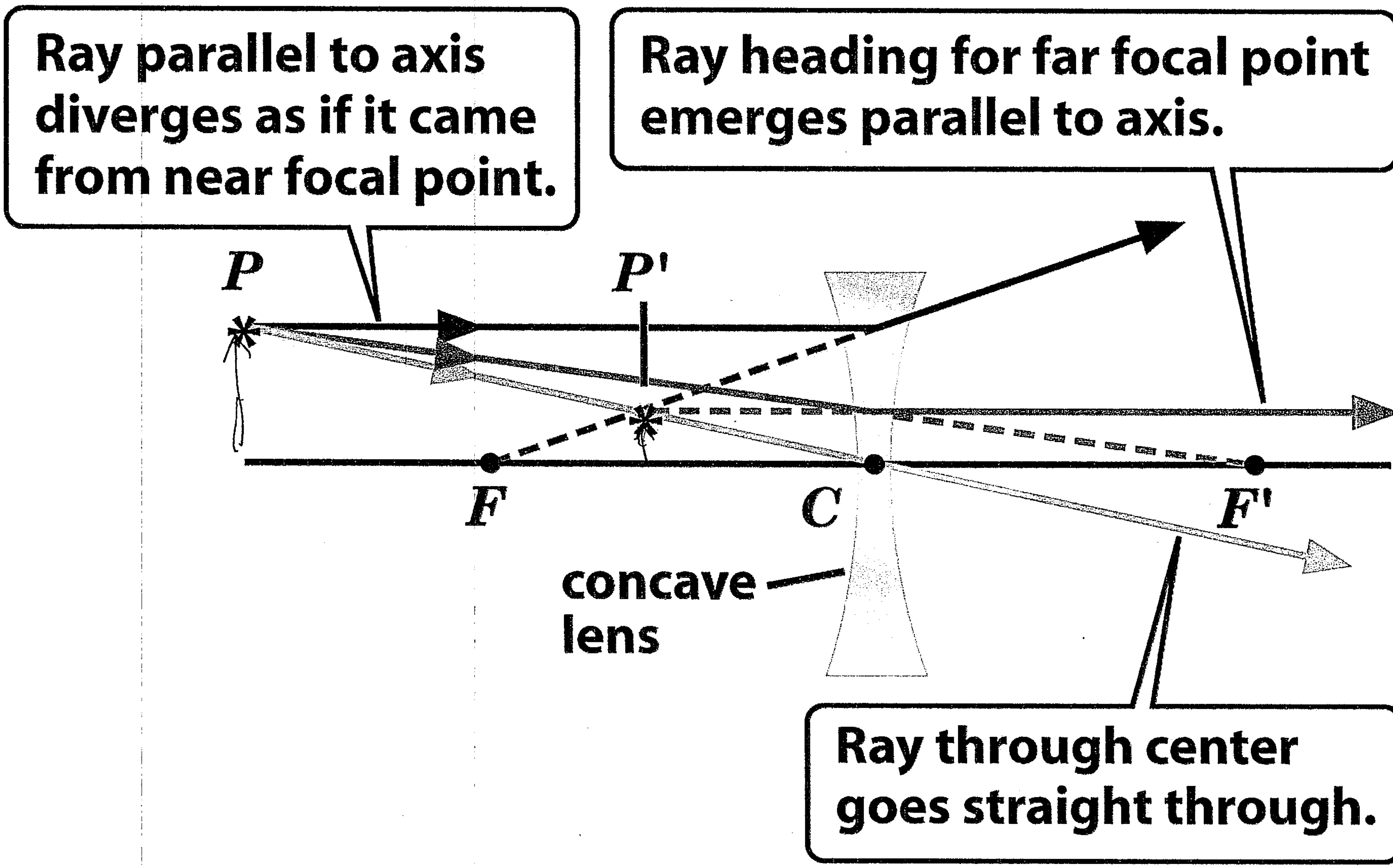


Figure 34-47 Physics for Engineers and Scientists 3/e

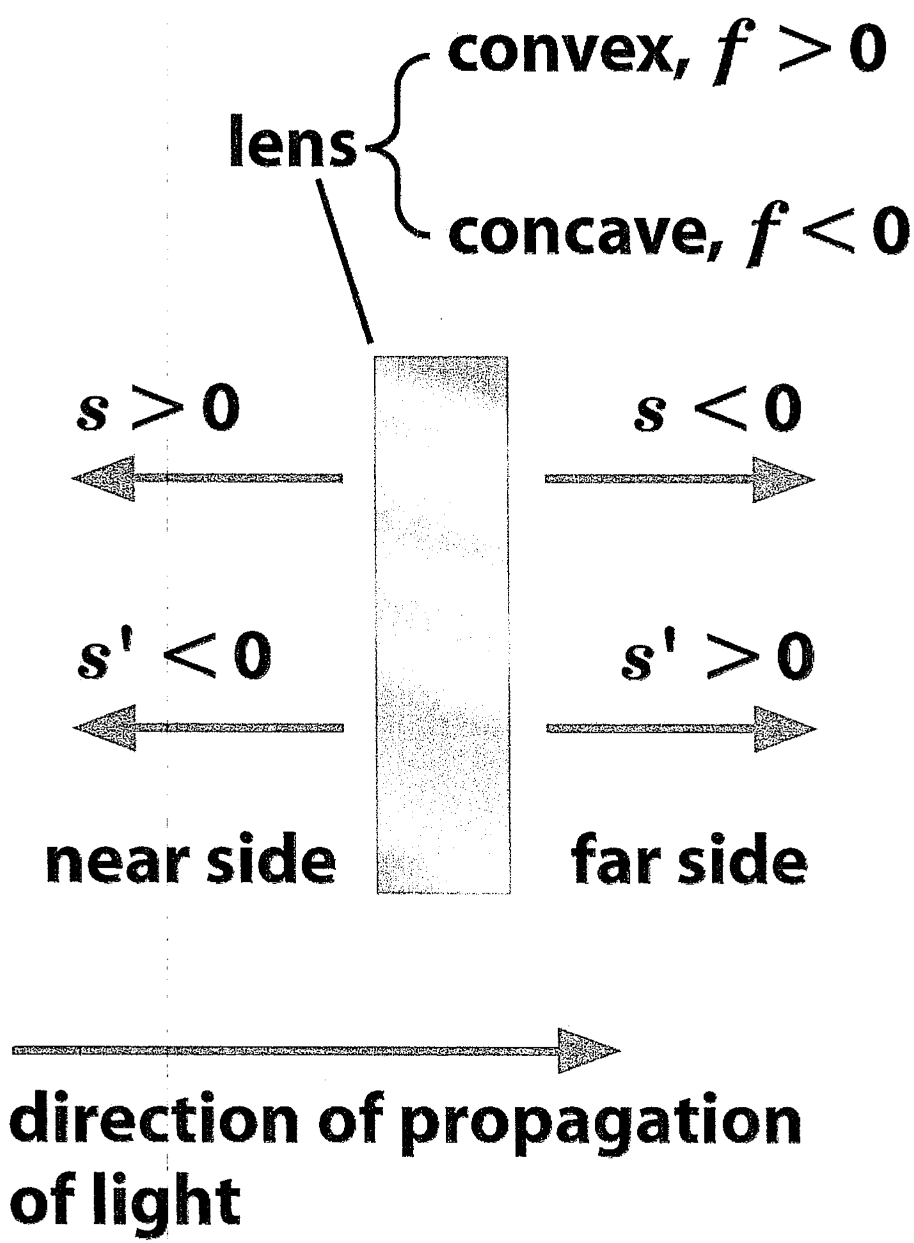


Figure 34-48 Physics for Engineers and Scientists 3/e

Formation of virtual enlarged upright image

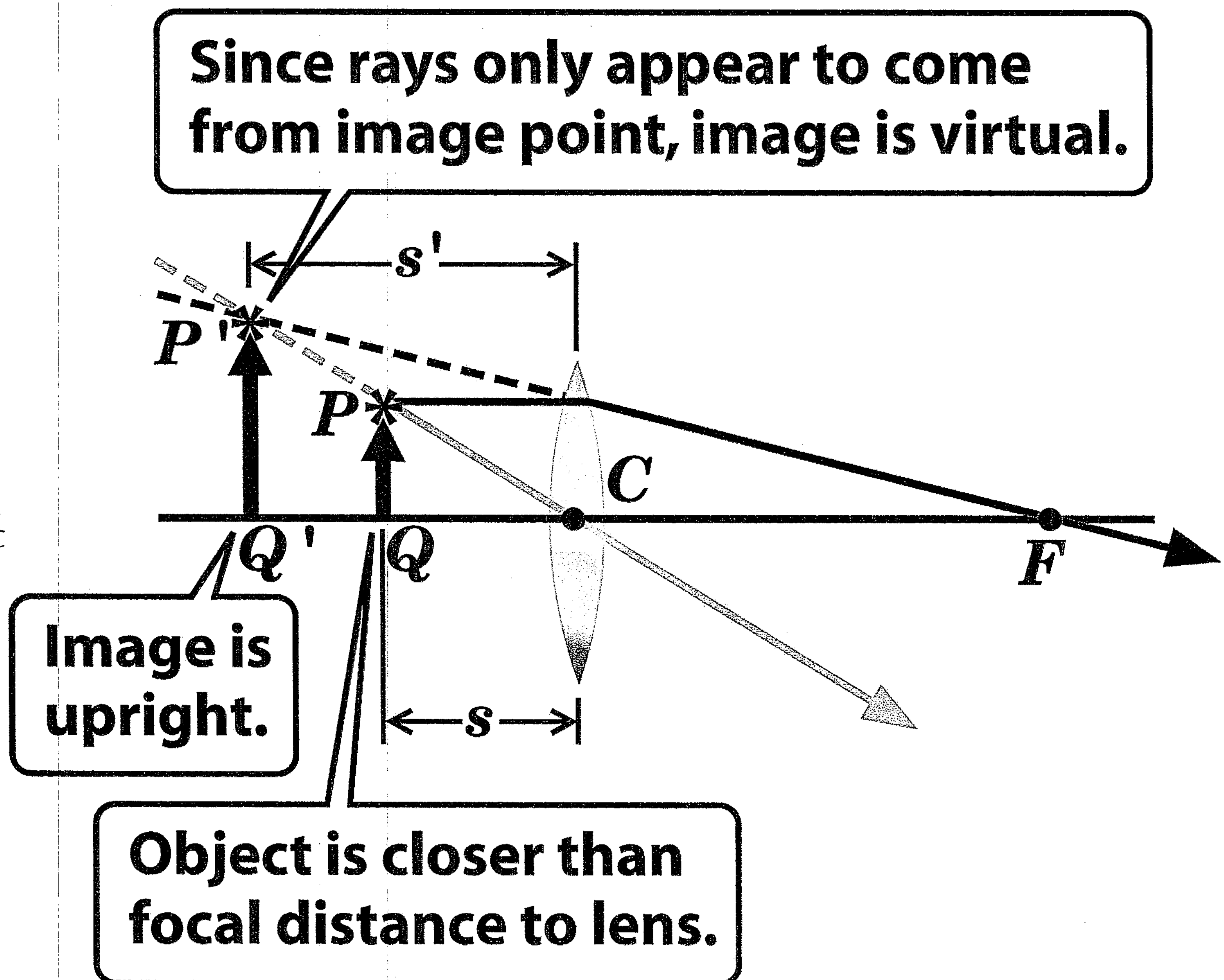


Figure 34-50 Physics for Engineers and Scientists 3/e

Formation of reduced upright image

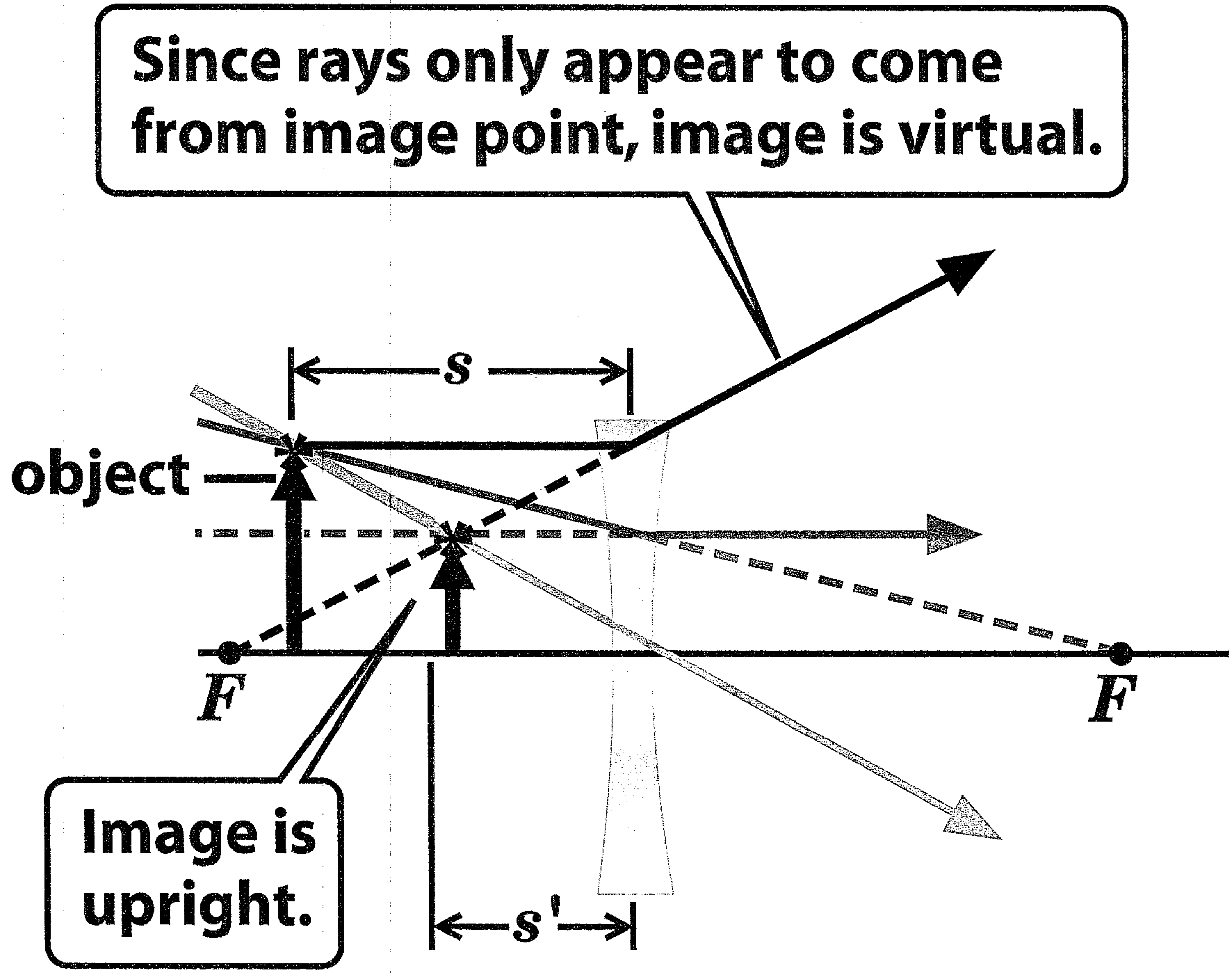


Figure 34-51 Physics for Engineers and Scientists 3/e

In camera lens focuses image onto film

$$\frac{1}{s} + \frac{1}{s'} = \frac{1}{f}$$

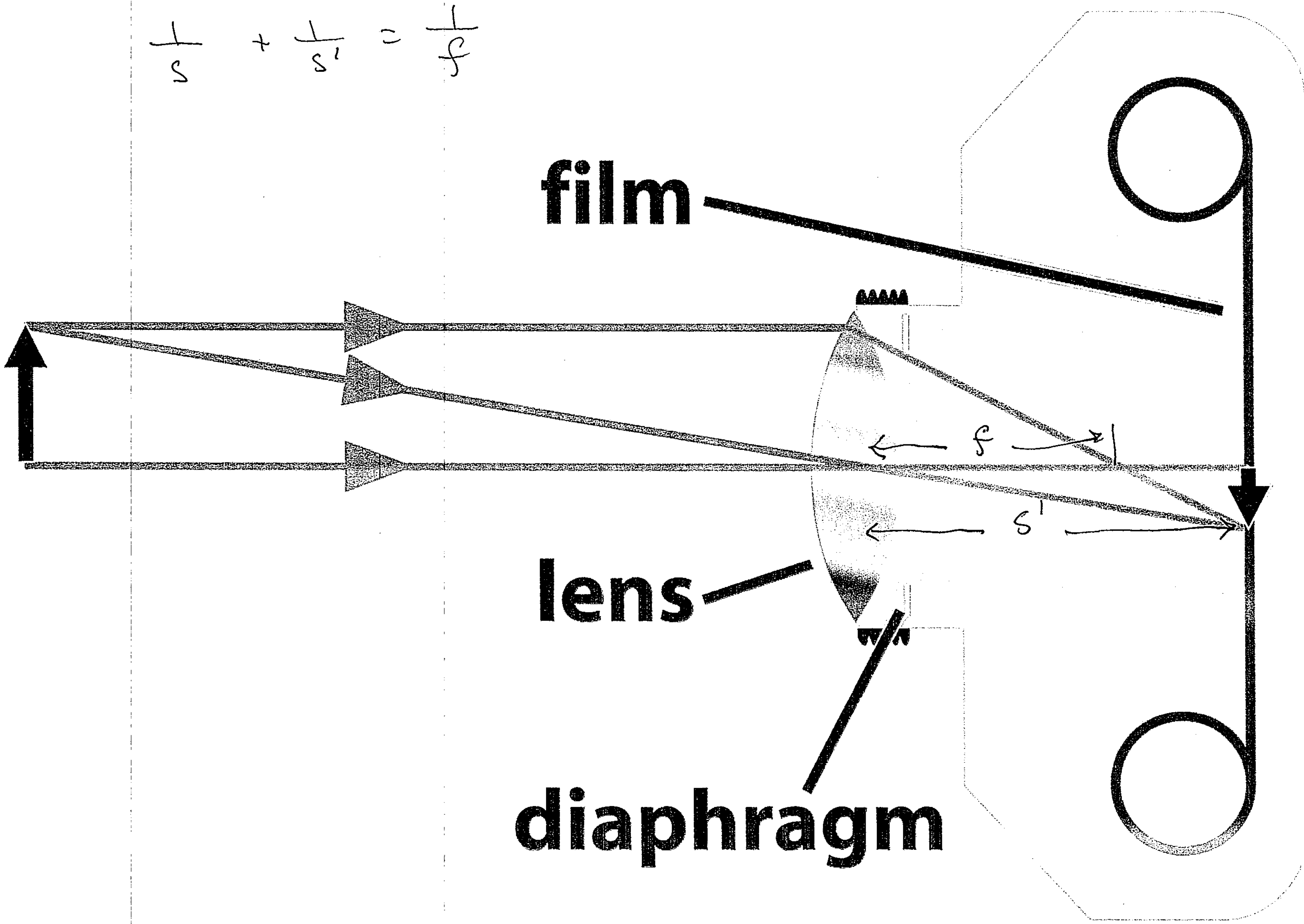


Figure 34-53 Physics for Engineers and Scientists 3/e

The eye is our "dynamic" camera

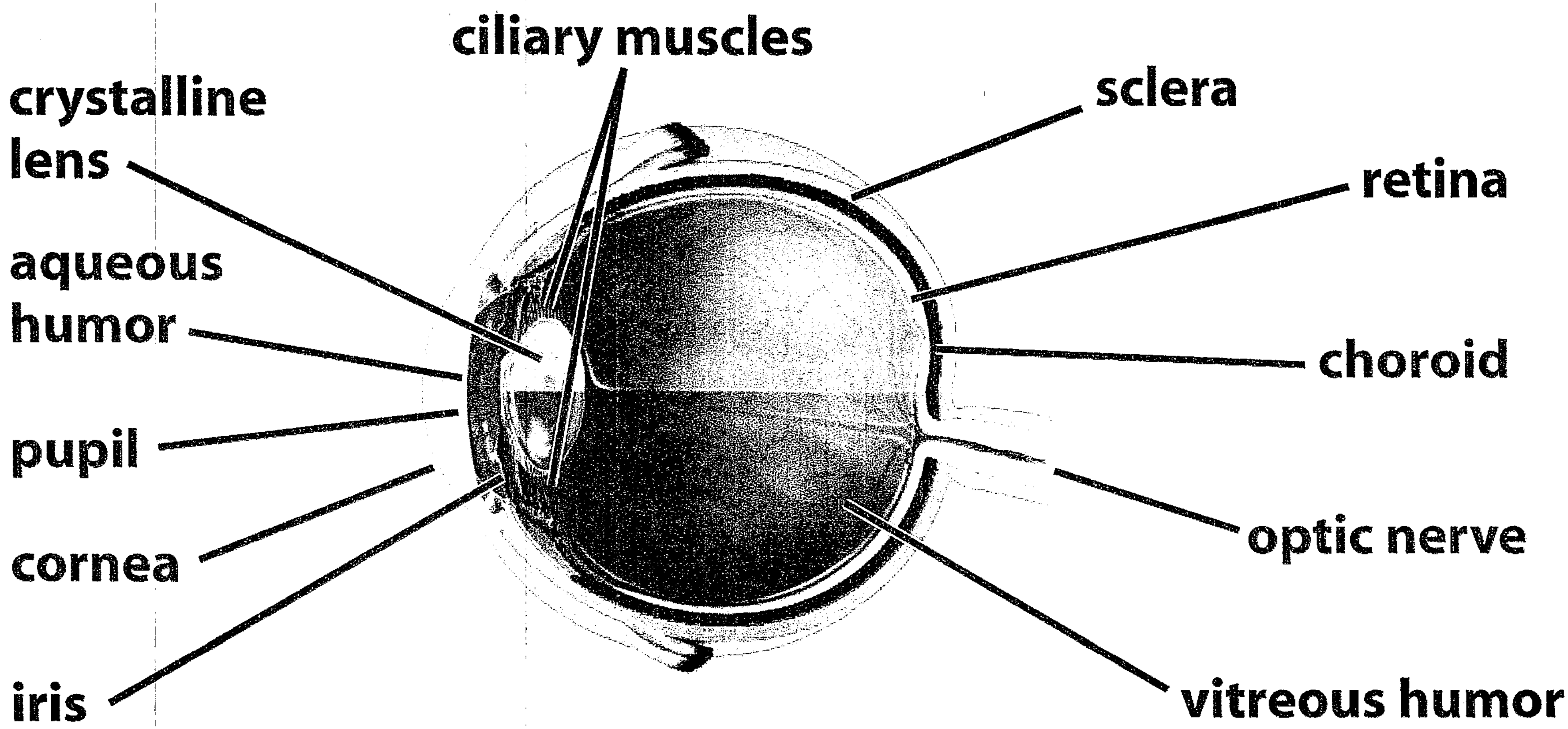


Figure 34-55 Physics for Engineers and Scientists 3/e

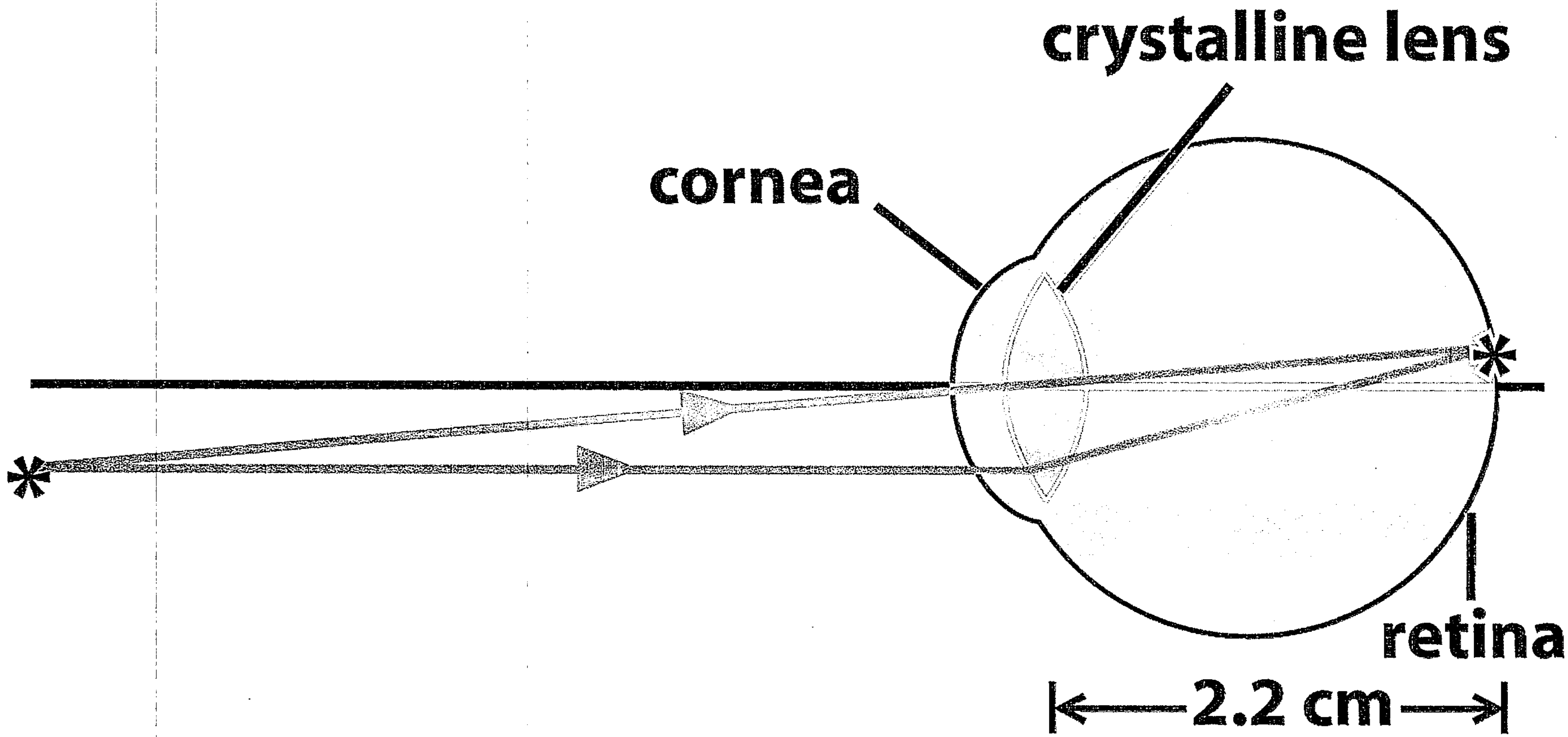


Figure 34-89 Physics for Engineers and Scientists 3/e

Near Sightedness

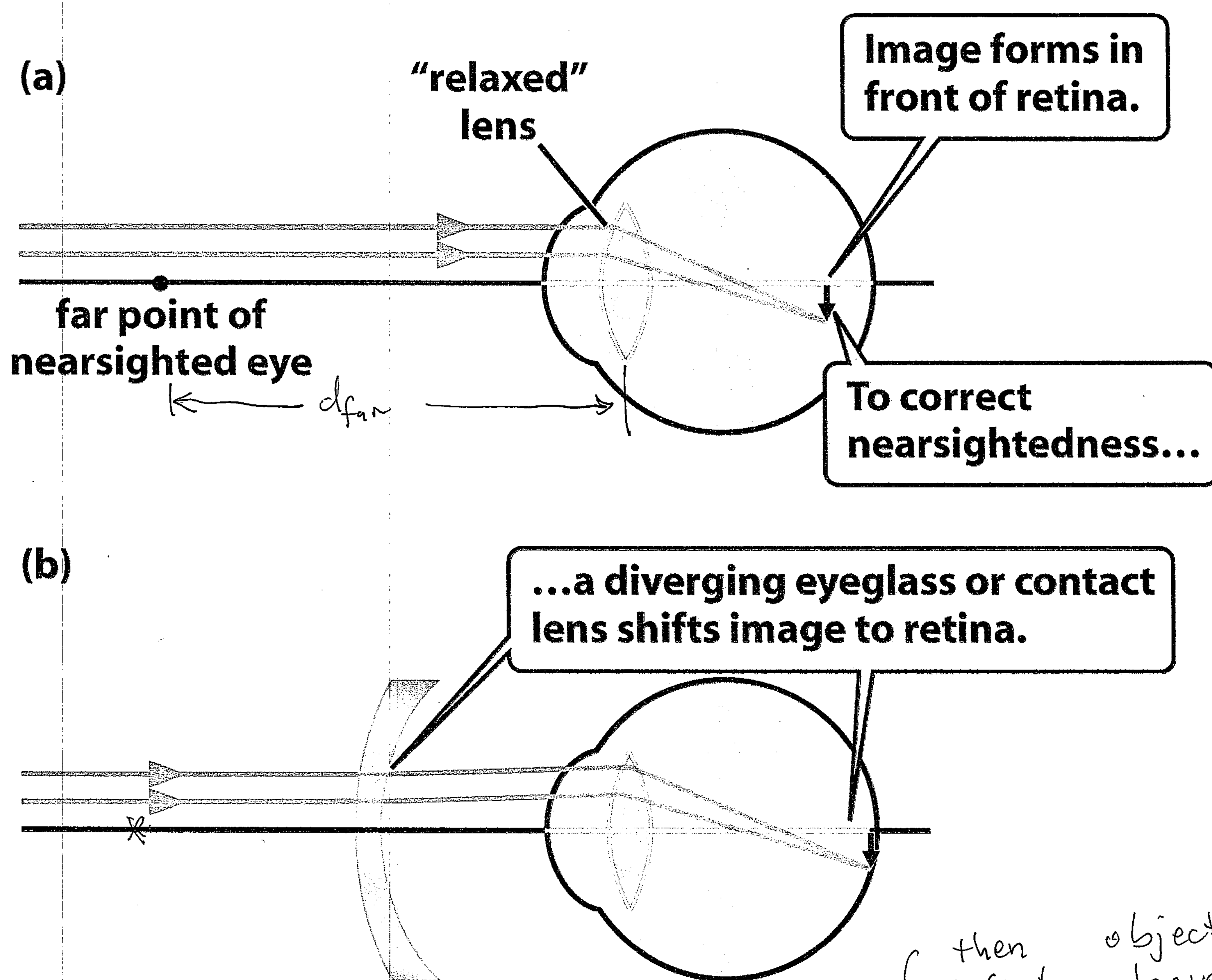
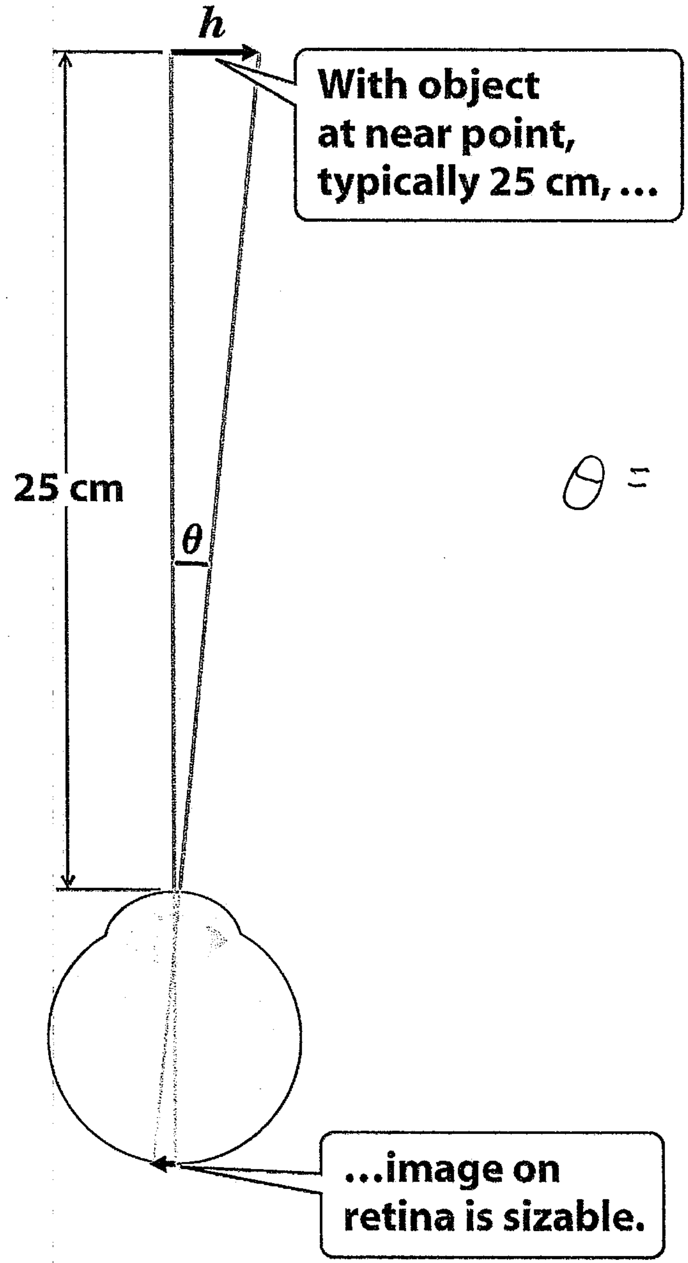


Figure 34-57 Physics for Engineers and Scientists 3/e

$f_{glass} = -d_{far}$ { then objects at infinity have virtual image at eye's far point

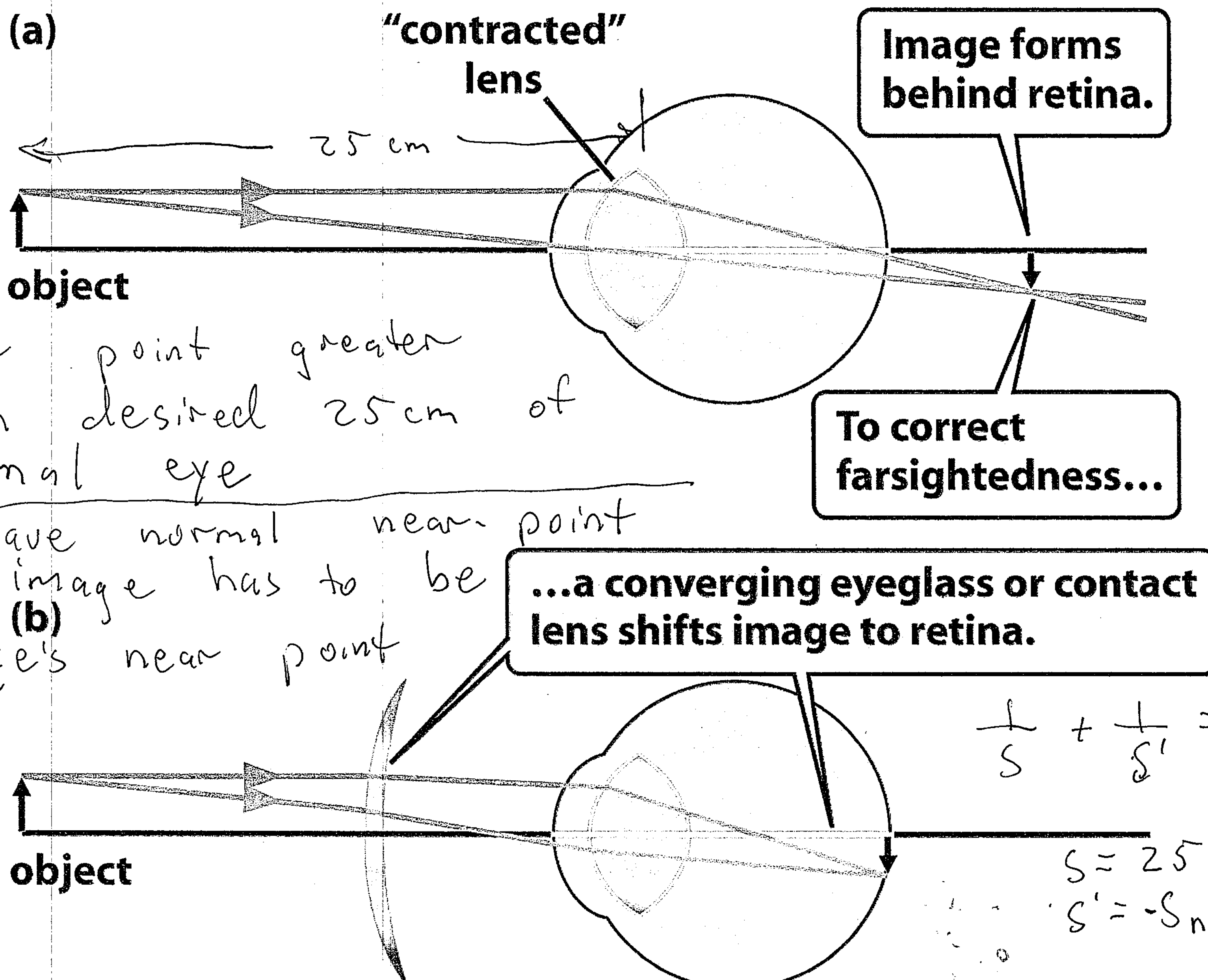
Natural Angular size of an object



$$\theta = \frac{h}{25}$$

Figure 34-60 Physics for Engineers and Scientists 3/e

Far sightedness



near point greater than desired 25 cm of normal eye

To have normal near point virtual image has to be at eye's near point

$$\frac{1}{s} + \frac{1}{s'} = \frac{1}{f}$$

$s = 25$ cm

$s' = -s_{np}$

$$\frac{1}{25} - \frac{1}{s_{np}} = \frac{1}{f}$$

$f = (s_{np} - 25)/[25 \cdot s_{np}]$

Figure 34-58 Physics for Engineers and Scientists 3/e