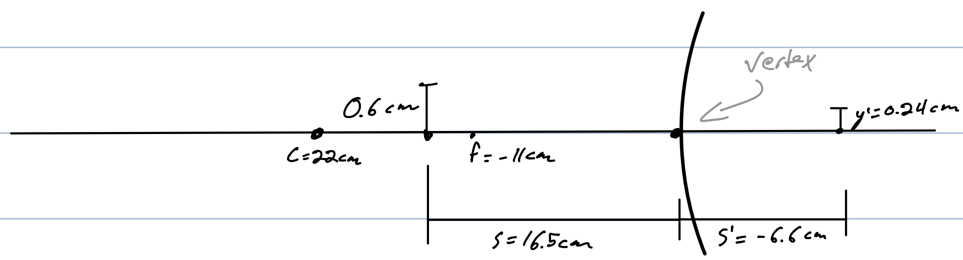
34.6)

object 0.6 cm tall placed 16.5 cm left of the vertex of a convex spherical mirror having a radius of curvature of 22.0 cm.



$f = -11.0\text{ cm}$

$s = 16.5\text{ cm}$

a)

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

$$s' = \frac{1}{\frac{1}{-11} - \frac{1}{16.5}}$$

$$s' = -6.6\text{ cm}$$

right of mirror

c) ∴ real

b)

$$y' = \frac{-s'}{s} y$$

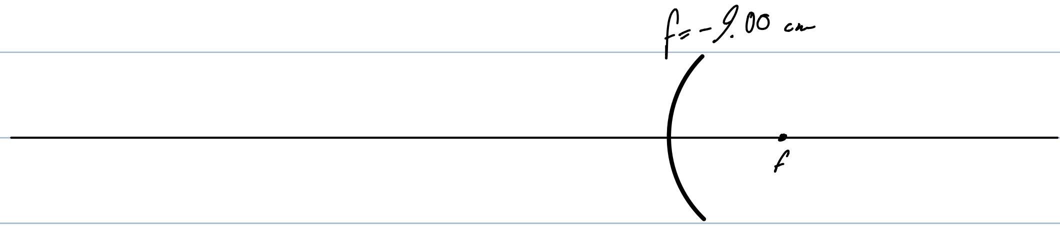
$$= \frac{-(-6.6)}{16.5} 0.6$$

$$y' = 0.24\text{ cm}$$

d) ∴ upright

34.14)

Consider a convex spherical mirror w/ focal length $f = -9.00$ cm.
What is the distance of an object from the mirror's vertex if the height of the image is half the height of the object?



$$\frac{y'}{y} = \frac{-s'}{s}$$

$$0.5 = \frac{-s'}{s}$$

$$\frac{1}{2}s = -s'$$

$$s' = -\frac{1}{2}s$$

$$s = -2s'$$

$$\frac{1}{-9} = \frac{1}{s'} + \frac{1}{s}$$

$$\frac{1}{-9} = \frac{1}{-\frac{1}{2}s} + \frac{1}{s}$$

$$\frac{1}{-9} = -\frac{2}{s} + \frac{1}{s}$$

$$1/-9 = -\frac{1}{s}$$

$$\frac{s}{-9} = -1$$

$$s = 9$$

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

$$\frac{1}{-9} = \frac{1}{9} + \frac{1}{s'}$$

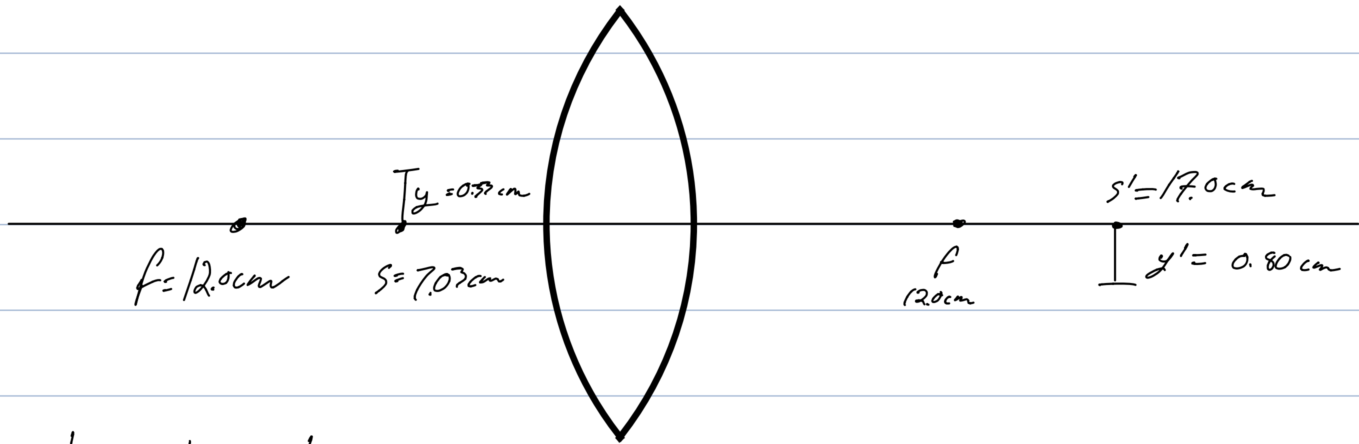
$$s' = \frac{1}{\frac{1}{-9} - \frac{1}{9}}$$

$$s' = -4.5$$

$$m = \frac{-(-4.5)}{9} = \frac{1}{2}$$

34.38)

A converging lens w/ focal length of 12.0 cm forms a visual image 8.00 mm tall, 17.0 cm to the right of the lens.



a)

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

$$\frac{1}{s} = \frac{1}{f} - \frac{1}{s'} \qquad \frac{1}{\frac{1}{12} - \frac{1}{17.0}}$$

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

$$s = \frac{1}{\frac{1}{12.0\text{ cm}} - \frac{1}{17.0\text{ cm}}} \qquad s = \frac{1}{\frac{1}{12} - \left(\frac{1}{-17}\right)}$$

$$\cancel{s = 40.799\text{ cm}} \qquad s = 7.03\text{ cm}$$

b) $y = -\dfrac{y' s}{s'}$

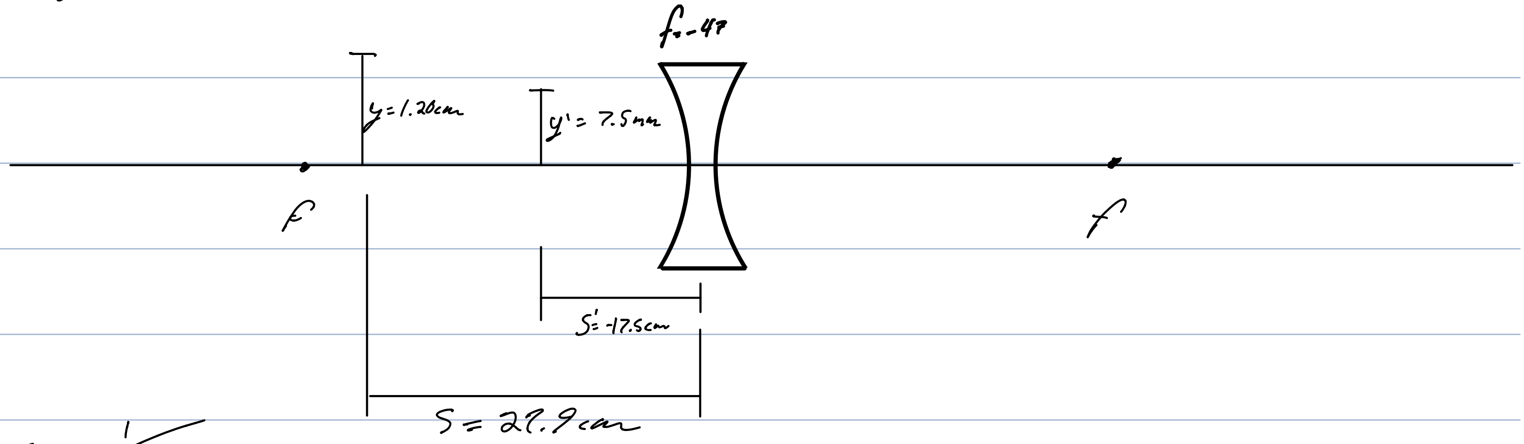
c) Upright or inverted?

$$y = \frac{-(0.8\text{ cm})\,7.03\text{ cm}}{-17.0\text{ cm}}$$

$$y = 0.33$$

34.39)

A diverging lens w/ a focal length of -47.0 cm forms a virtual image 7.50 mm tall, 17.5 cm to the right of the lens.



$$S = \frac{1}{1/f - 1/s'}$$

$$= \frac{1}{\frac{1}{-47} - \frac{1}{-17.5}}$$

$S = 27.9$ cm

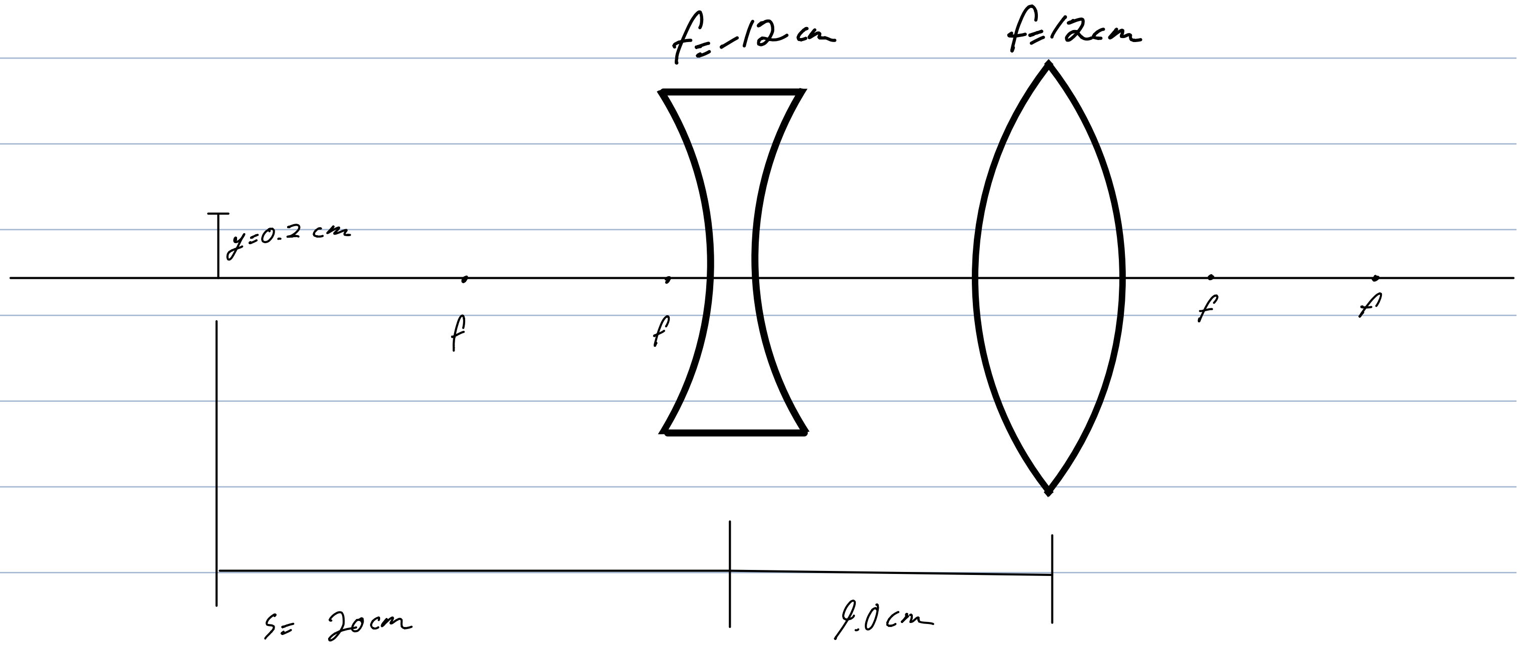
$$y = \frac{y' S}{-S'}$$

$$y = \frac{(0.75cm)(27.9cm)}{-(-17.5cm)}$$

$y = 1.195$

34.43)

Two thin lenses w/ a focal length of 120cm, the first diverging & the second converging, are 9.00 cm apart. An object 2.00mm tall is 20.0cm to the left of the first (diverging lens).



$s_1 = 20$

$s_1' = \frac{1}{\frac{1}{f_1} - \frac{1}{s_1}}$

$s_1' = \frac{1}{\frac{1}{-12} - \frac{1}{20}}$

$s_1' = -7.5\text{cm}$

$s_2 = 9 + 7.5$

$s_2 = 16.5\text{ cm}$

$s_2' = \frac{1}{\frac{1}{f_2} - \frac{1}{s_2}}$

$= \frac{1}{\frac{1}{12} - \frac{1}{16.5}}$

$y_1' = \frac{-s_1'}{s_1} y_1$

$= -\frac{-7.5}{20} 0.2\text{cm}$

$y_1' = 0.075\text{cm}$

$y_2 = y_1'$

$y_2' = -\frac{s_2'}{s_2} y_2$

$= -\frac{44}{16.5} 0.075$

$y = -0.2\text{ cm}$

inverted

$s_2' = 44.0$ cm right of 2nd lens

($\therefore$ real)

from 1st lens: 53 cm