

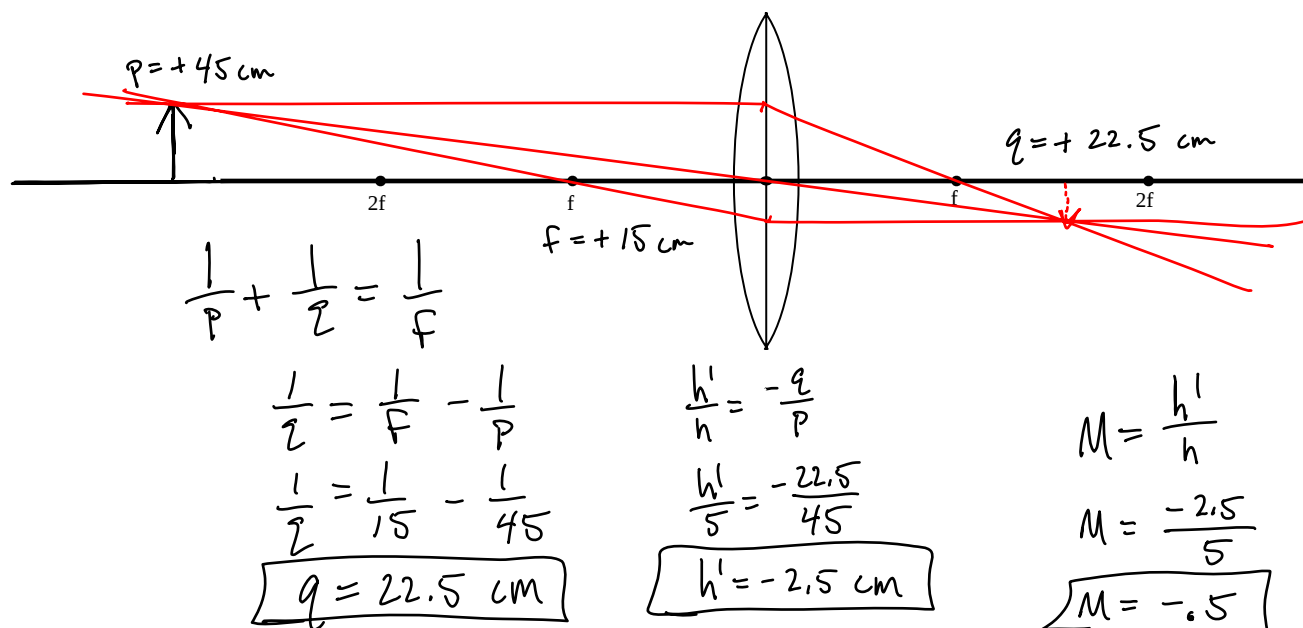
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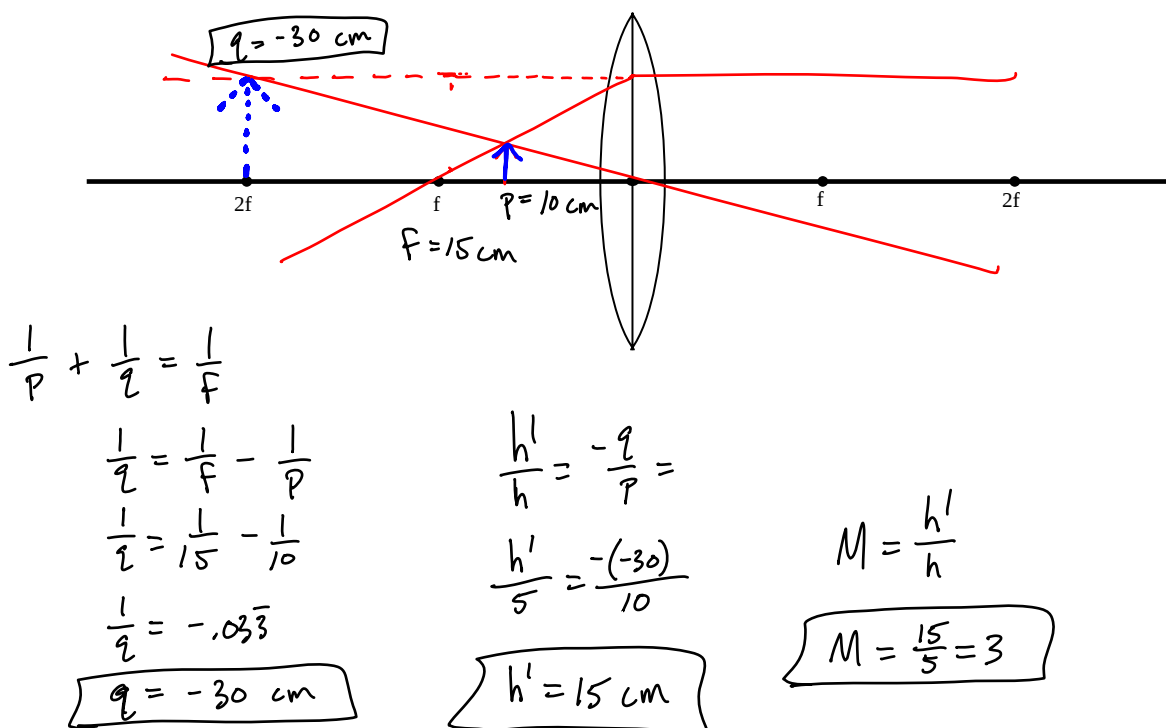
Section C D F

Refraction IV: Lens Calculations

1. Determine image distance, image height, and magnification for a 5-cm tall object placed 45.0 cm from a converging lens having a focal length of 15.0 cm. Please draw a diagram.



2. Determine q , h' , and M for a 5-cm tall object placed 10.0 cm from a converging lens having a focal length of 15.0 cm. Draw a diagram.



3. A magnified, inverted image is located a distance of 32.0 cm from a converging lens with a focal length of 12.0 cm . Determine the object distance and tell whether the image is real or virtual. After calculations, please fill in the diagram.

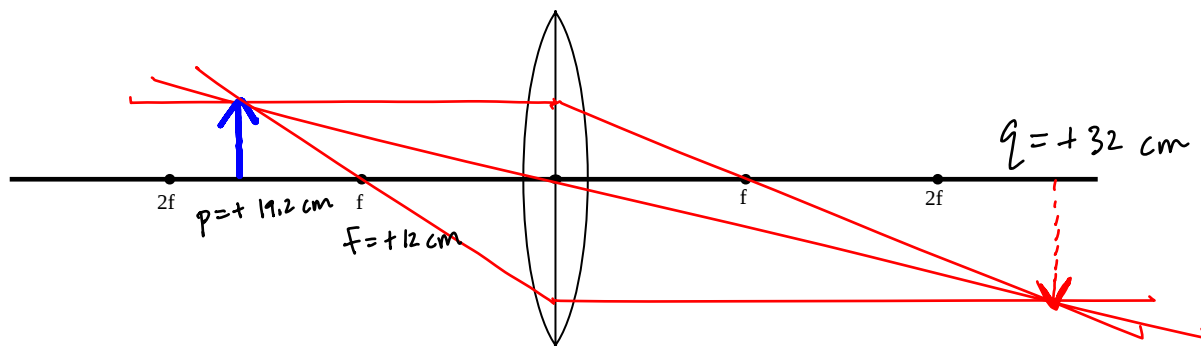
$$\frac{1}{p} + \frac{1}{q} = \frac{1}{f}$$

$$\frac{1}{p} = \frac{1}{f} - \frac{1}{q}$$

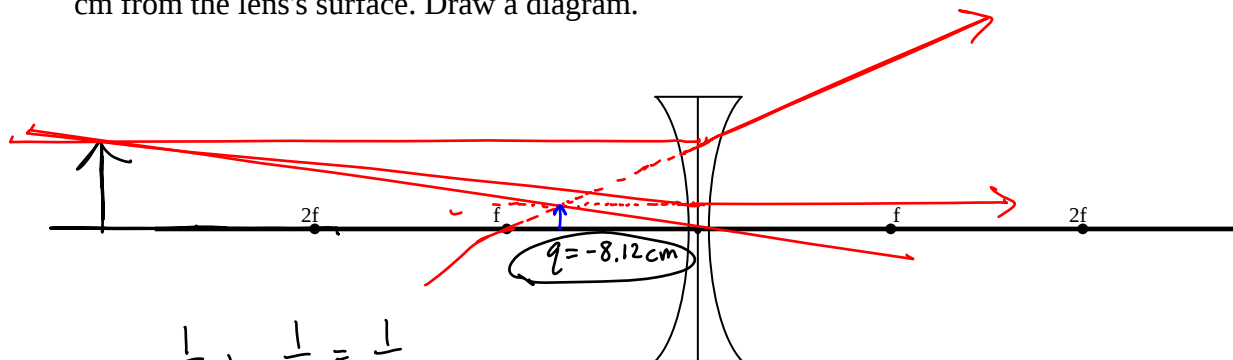
$$\frac{1}{p} = \frac{1}{12} - \frac{1}{32}$$

$$p = 19.2$$

Real Image



4. If a diverging lens has a focal length of -10.8 cm , find the image distance when an object is placed 32.7 cm from the lens's surface. Draw a diagram.



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

$$\frac{1}{q} = \frac{1}{f} - \frac{1}{p}$$

$$\frac{1}{q} = \frac{1}{-10.8} - \frac{1}{32.7}$$

$$\frac{1}{q} = -.123$$

$$q = -8.12\text{ cm}$$

5. A person looks at a 5 cm tall crystal with a jeweler's microscope - a converging lens with a focal length of 12.7 cm. The microscope forms a virtual image 31.6 cm from the lens. Determine the object distance, and magnification of the image. After calculations, please fill in the diagram.

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

$$\frac{1}{p} = \frac{1}{f} - \frac{1}{q}$$

$$\frac{1}{p} = \frac{1}{12.7} - \frac{1}{-31.6}$$

$$p = 9.06 \text{ cm}$$

$$\frac{h'}{h} = \frac{-q}{p}$$

$$\frac{h'}{5} = \frac{-(-31.6)}{9.06}$$

$$h' = 17.44 \text{ cm}$$

$$M = \frac{h'}{h}$$

$$M = \frac{17.44}{5} = 3.49$$

