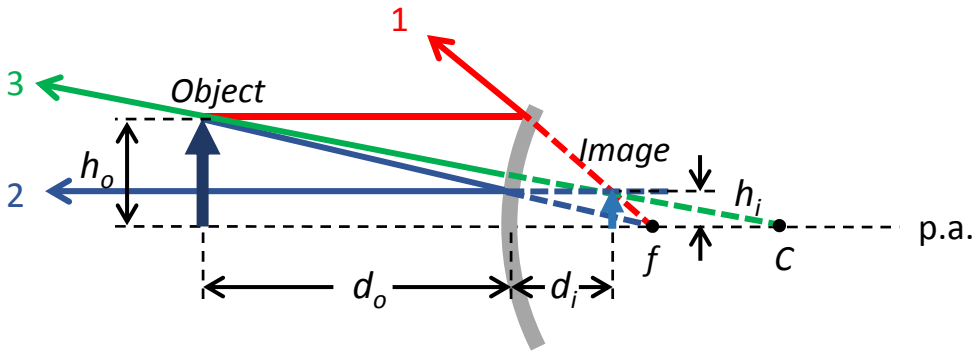
Mirror distance & magnification conventions



$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i} \qquad m \equiv \frac{h_i}{h_o} = -\frac{d_i}{d_o}$$

- Principal ray:
  1) parallel to principal axis, reflects through *f*
  2) through *f*, reflects parallel to principal axis
  3) through *C*, reflects through *C*

- d_o = distance object is from mirror:
  > 0: object in front of mirror
  < 0: object behind mirror

- h_o = height of object:
  > 0: always

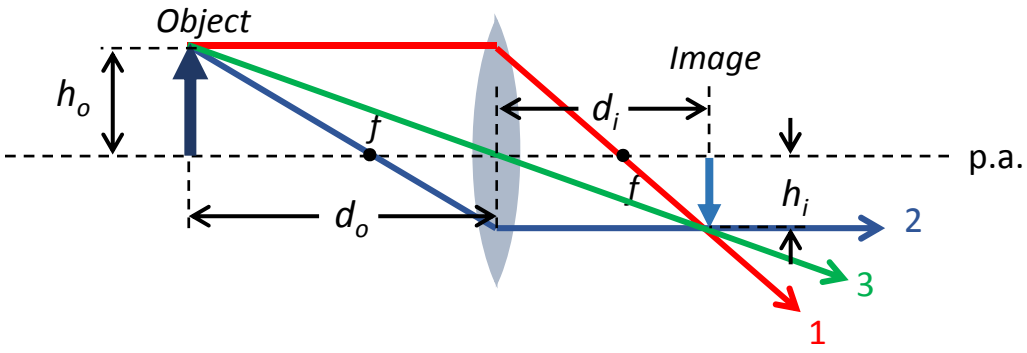
- d_i = distance image is from mirror:
  > 0: real image (in front of mirror)
  < 0: virtual image (behind mirror)

- h_i = height of image:
  > 0: image is upright
  < 0: image is inverted

- f = focal length mirror:
  > 0: concave mirror $+R/2$
  < 0: convex mirror $-R/2$

- $|m|$ = magnification:
  < 1: image is reduced
  > 1: image is enlarged

Lens distance & magnification conventions



$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i} \qquad m \equiv \frac{h_i}{h_o} = -\frac{d_i}{d_o}$$

- Principal ray:
  1) parallel to principal axis, refracts through *f*
  2) through *f*, refracts parallel to principal axis
  3) through *center*, travels straight

- d_o = distance object is from lens:
  > 0: object before lens
  < 0: object after lens

- h_o = height of object:
  > 0: always

- d_i = distance image is from lens:
  > 0: real image (after lens)
  < 0: virtual image (before lens)

- h_i = height of image:
  > 0: image is upright
  < 0: image is inverted

- f = focal length lens:
  > 0: converging lens
  < 0: diverging lens

- $|m|$ = magnification:
  < 1: image is reduced
  > 1: image is enlarged