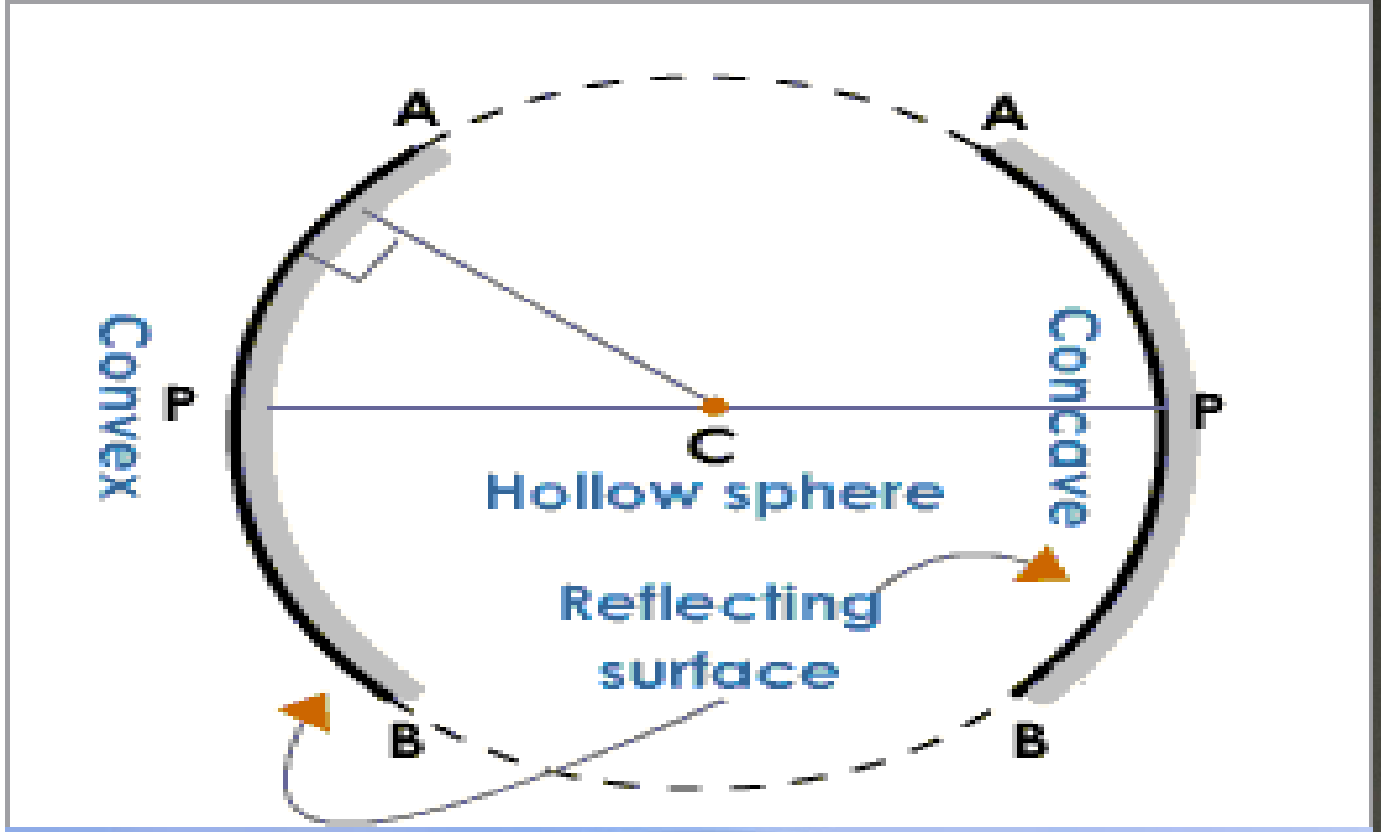
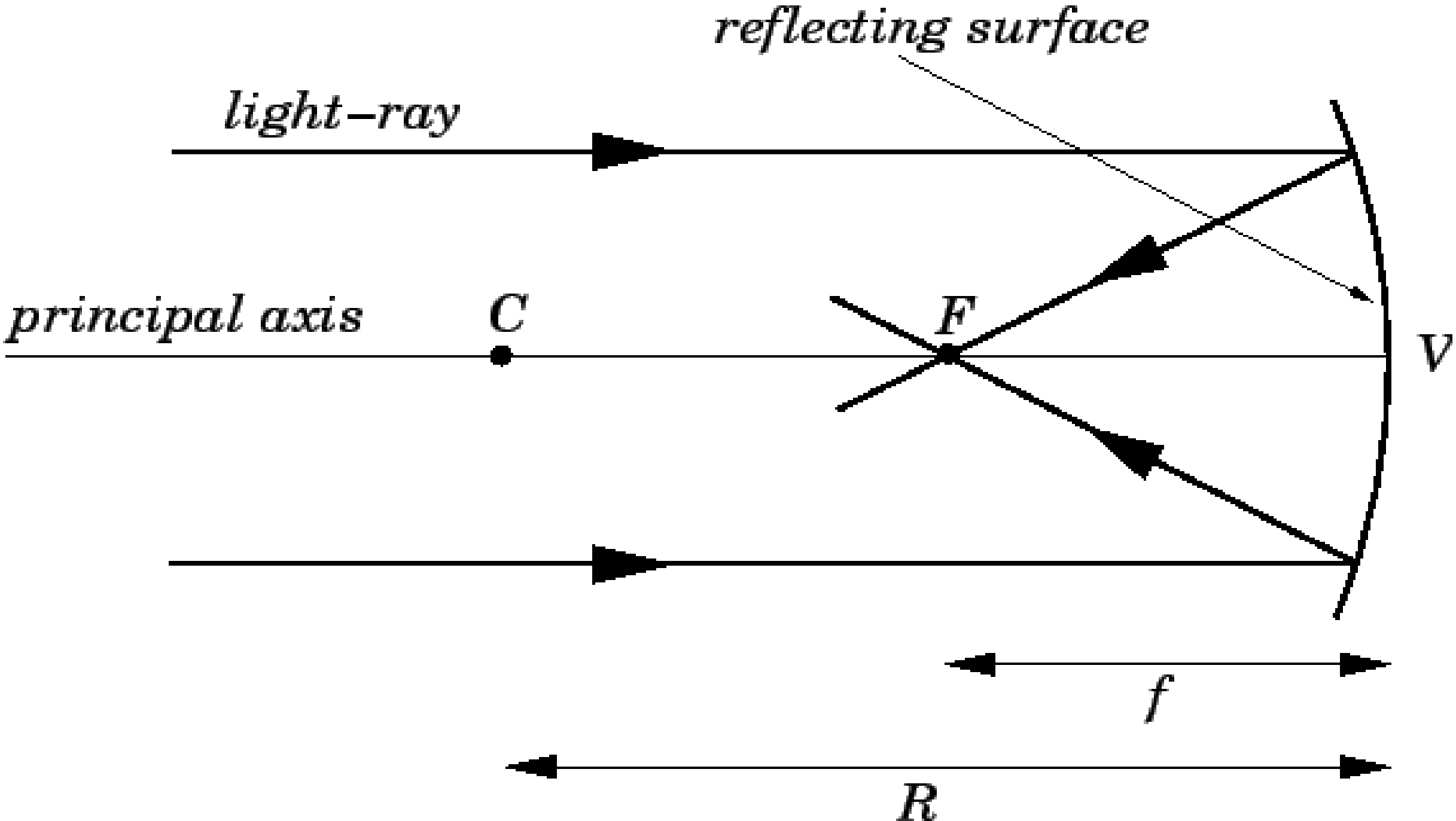
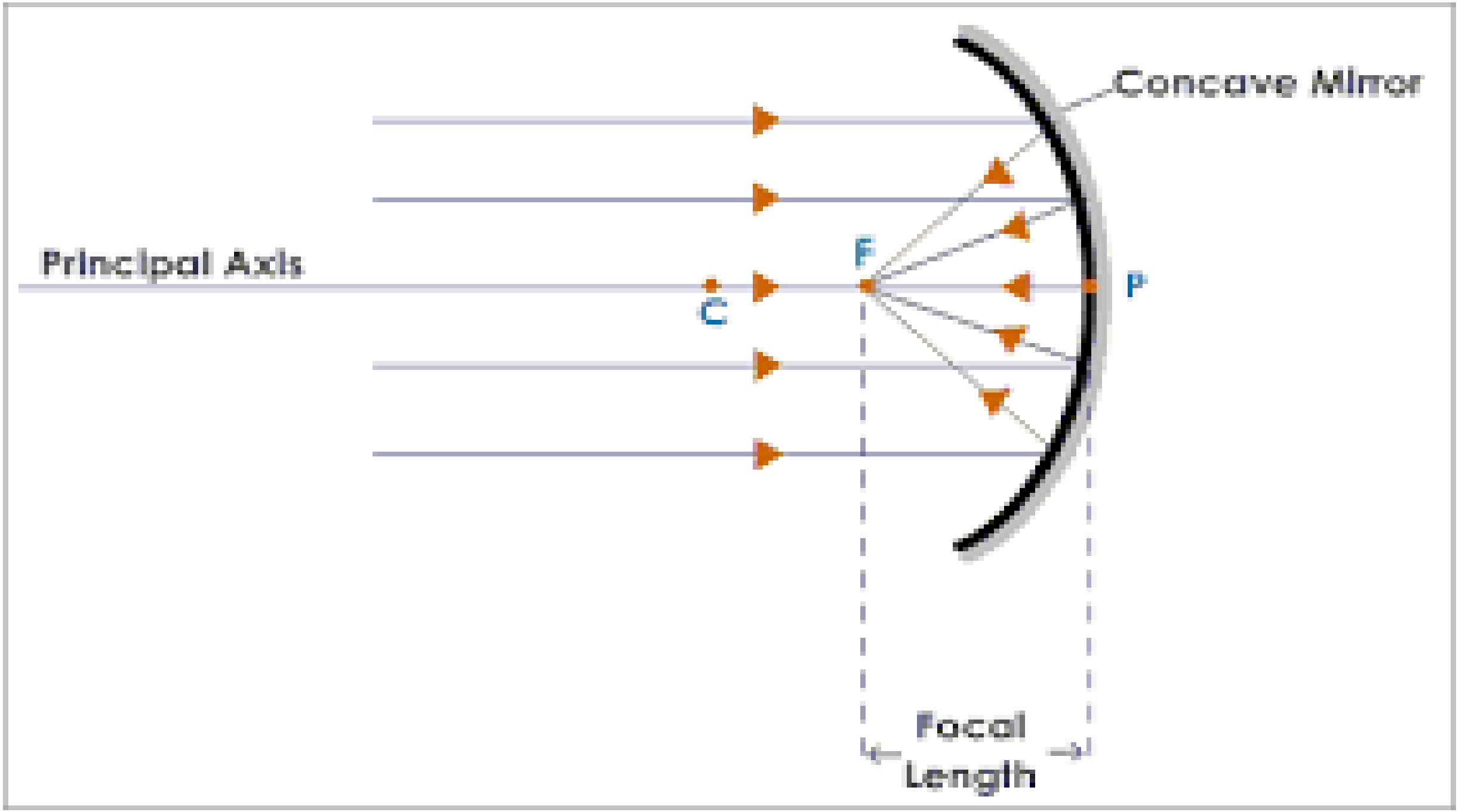
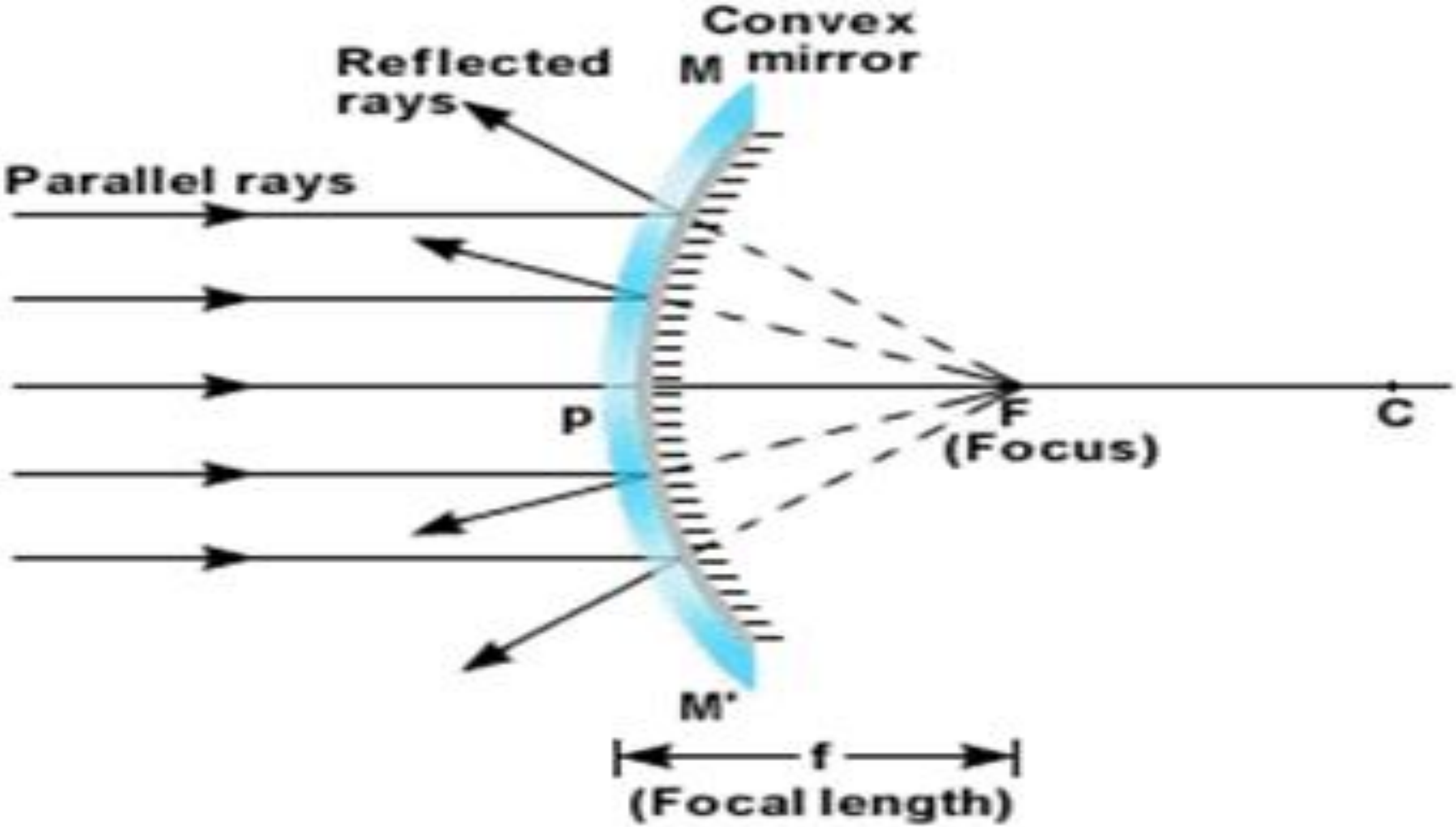

A
A
Convex
P
C
P
Concave
Hollow sphere
Reflecting
surface
B
B

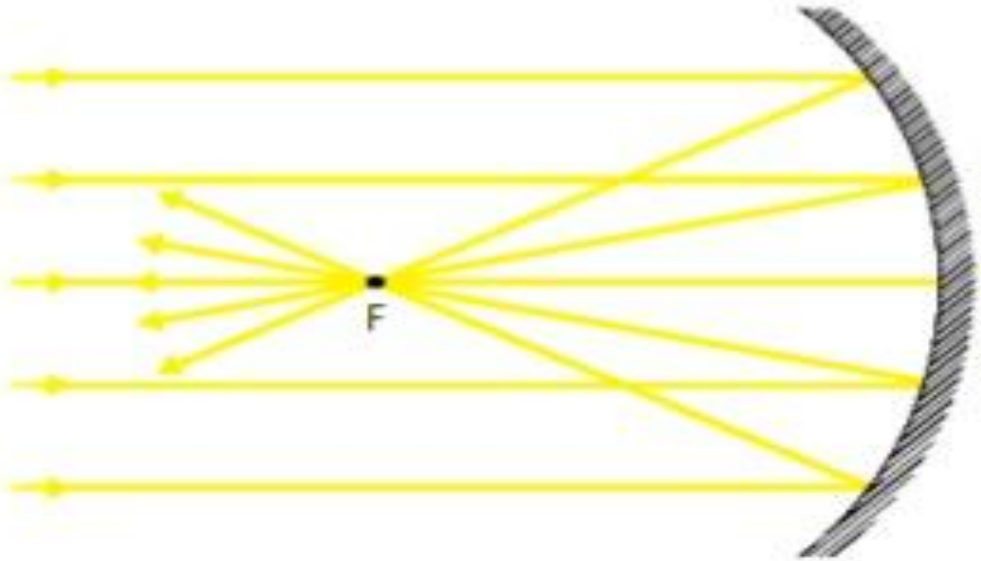

reflecting surface
light–ray
principal axis
C
F
V
f
R


Concave Mirror
Principal Axis
F
C
P
Focal
Length


Convex
mirror
M
Reflected
rays
Parallel rays
P
F
(Focus)
C
M'
f
(Focal length)

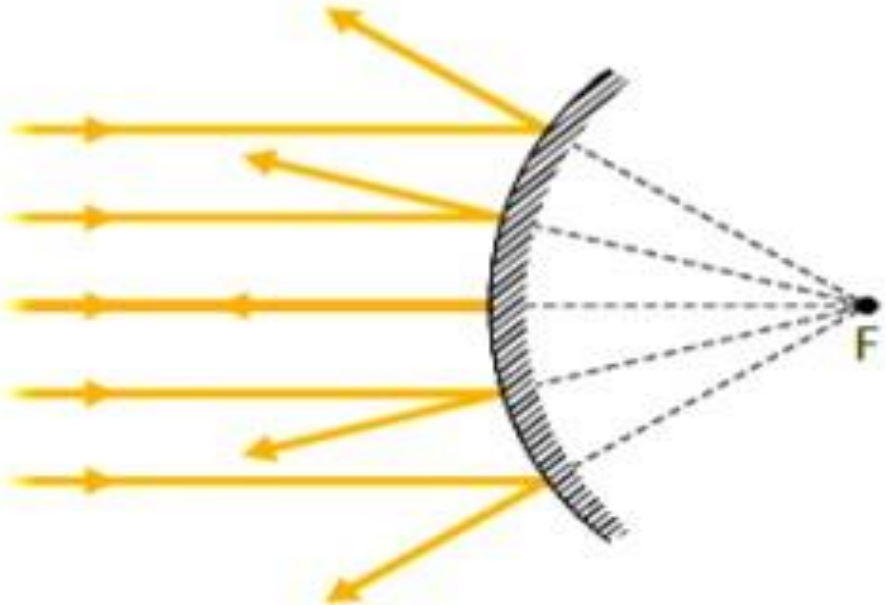
Curved Mirrors

Concave



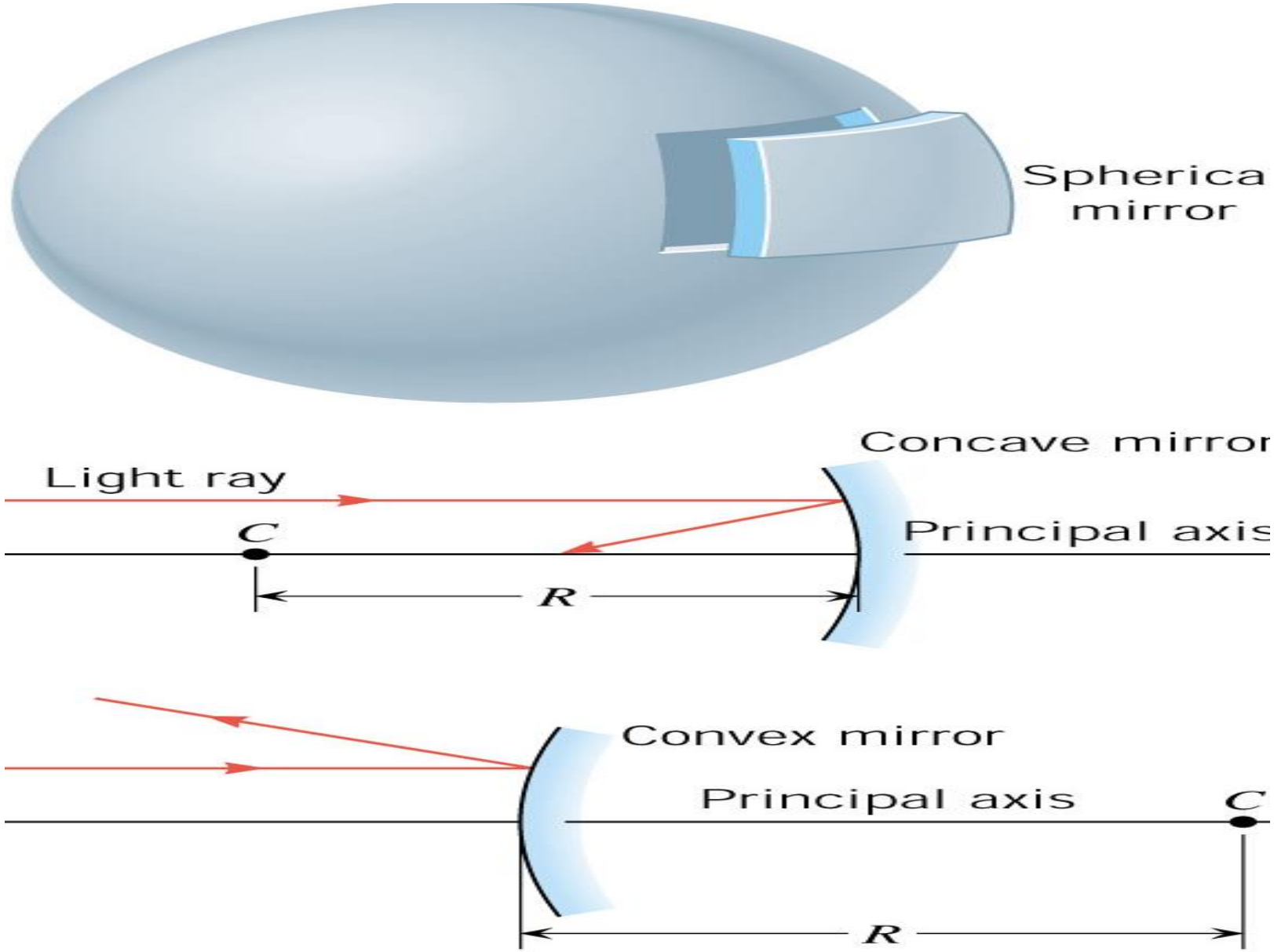
"converging" mirror

Convex

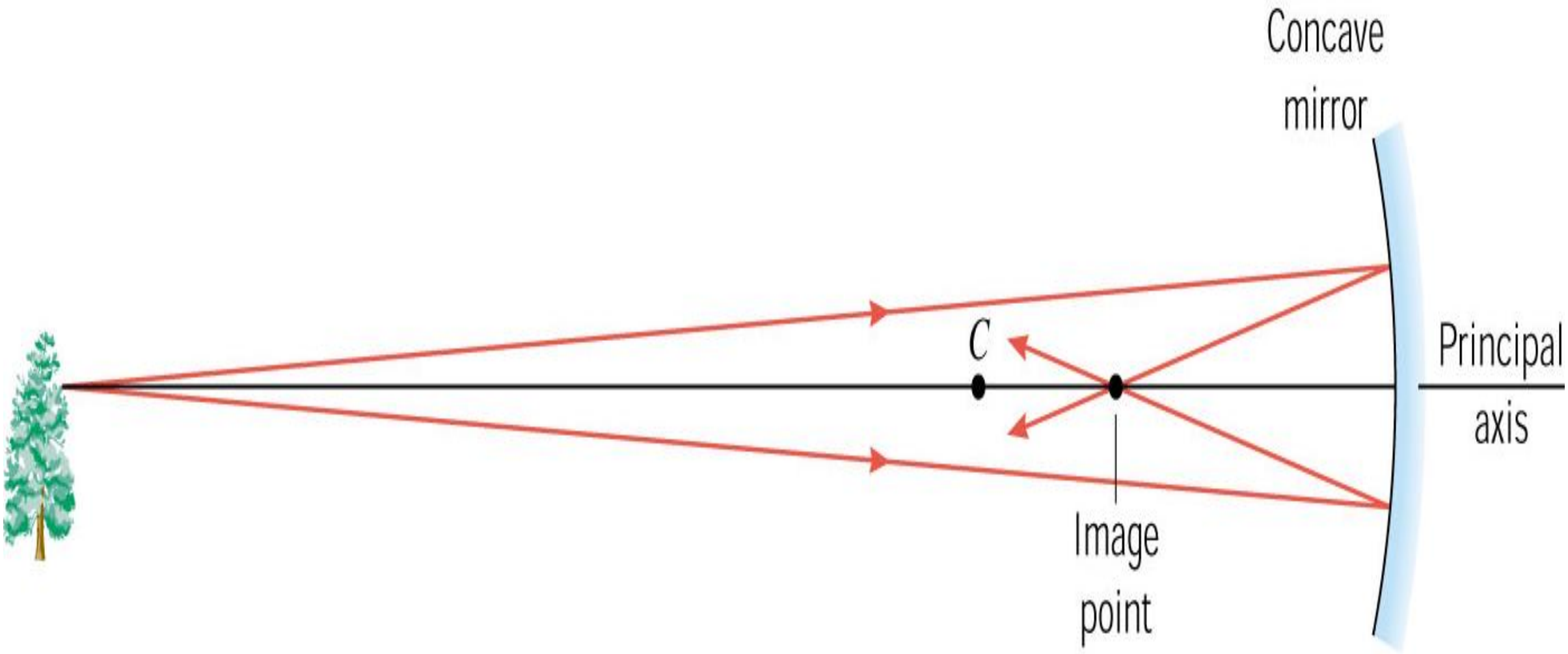


"diverging" mirror

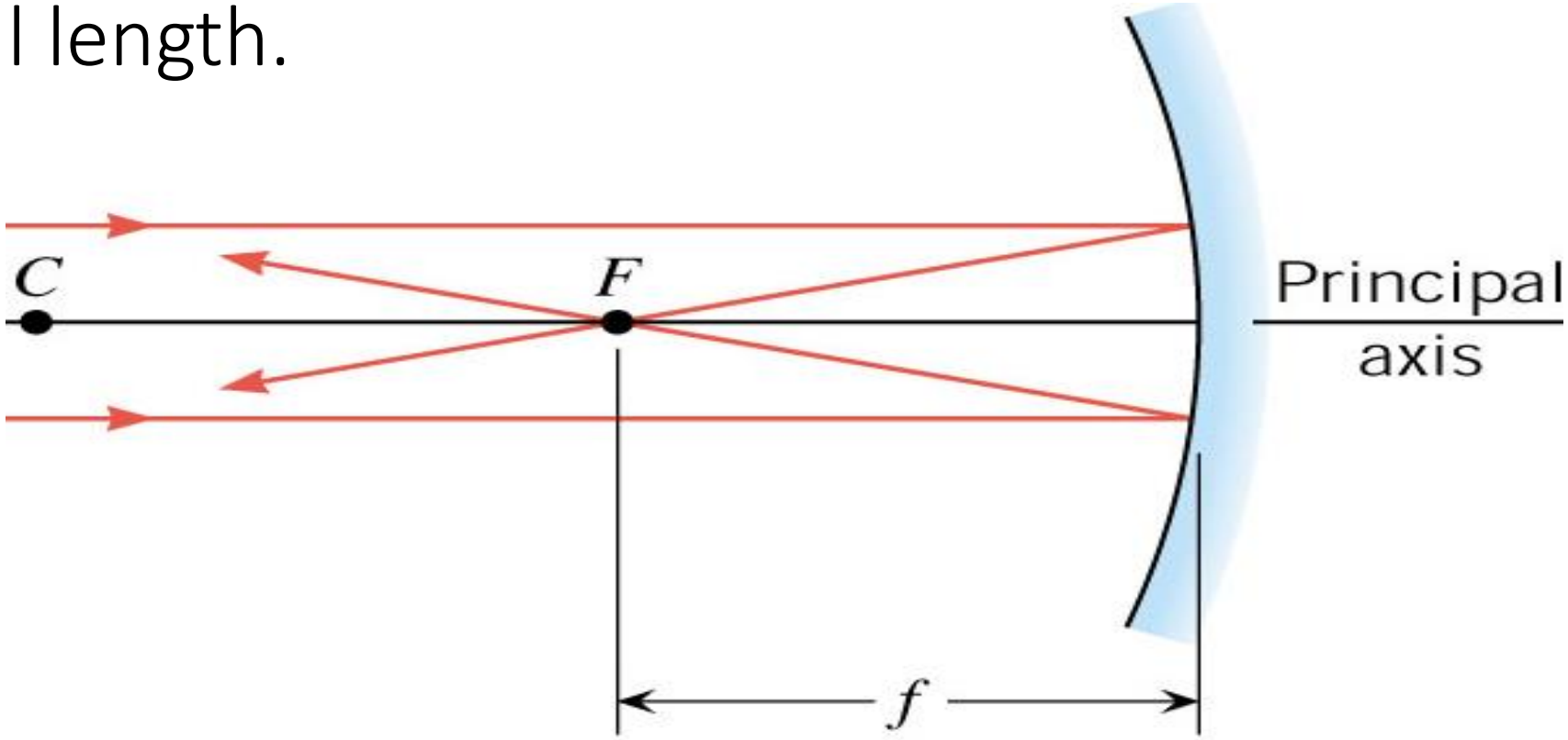
Spherical or Curved Mirrors



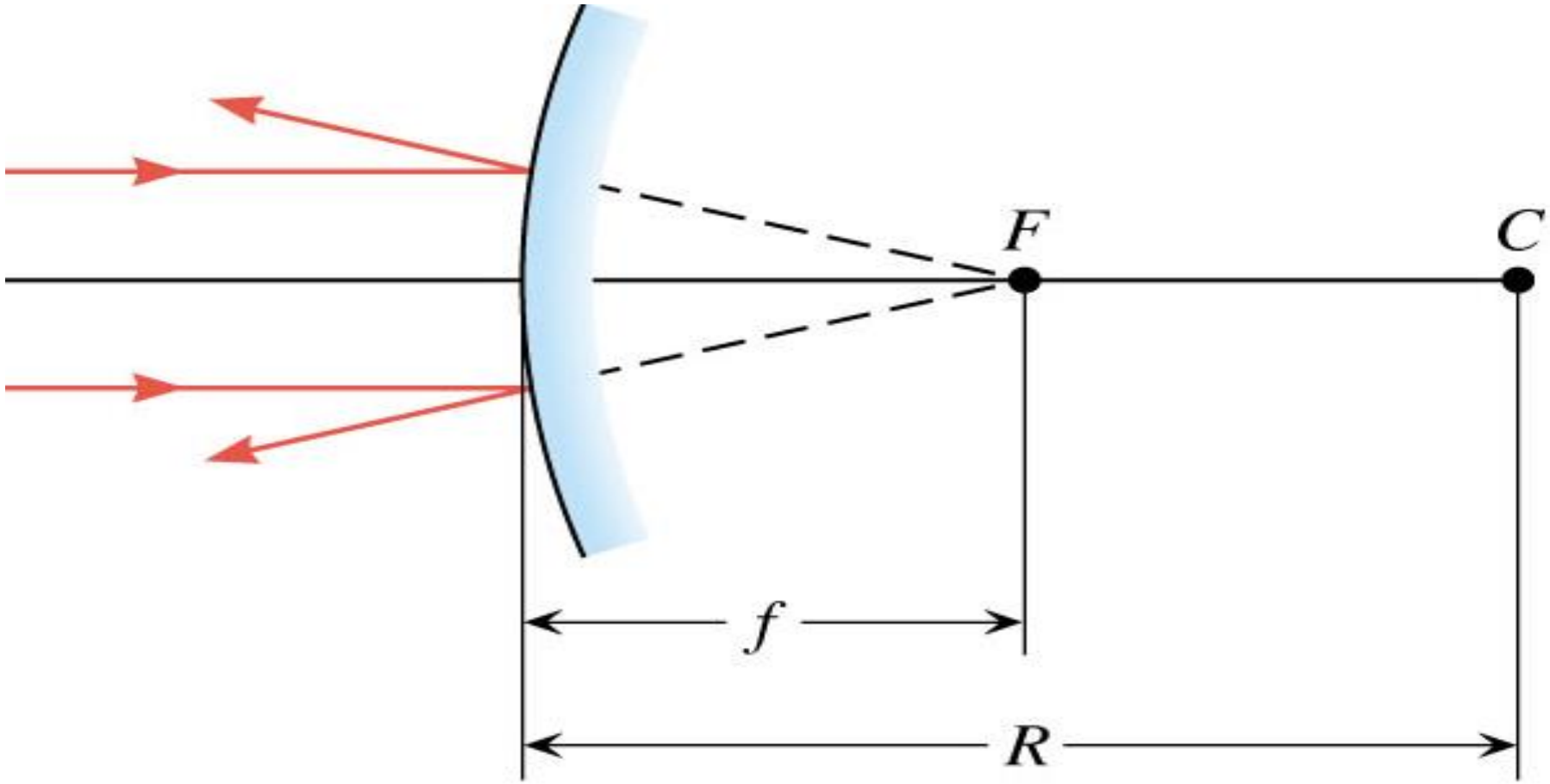
Where the actual light rays converge, the ***real image*** is produced.



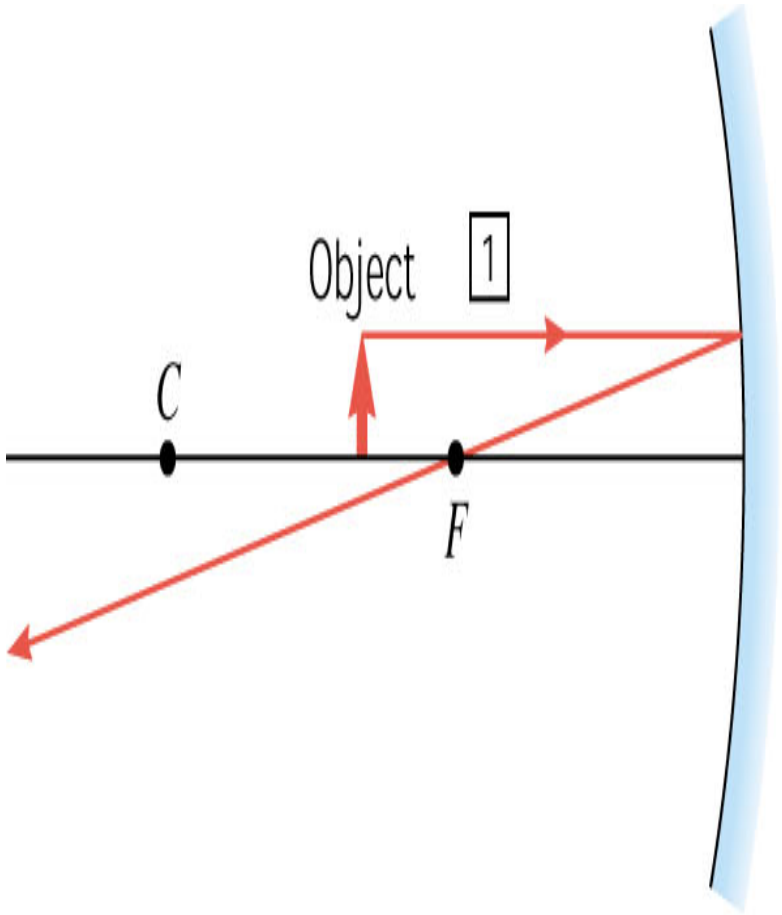
When light rays come from a distant source (ex: sun) and are incident parallel to each other, they will reflect and converge to a point halfway between the mirror and that mirror's center of curvature, called the Focal Point (F).
(*f*) = focal length.

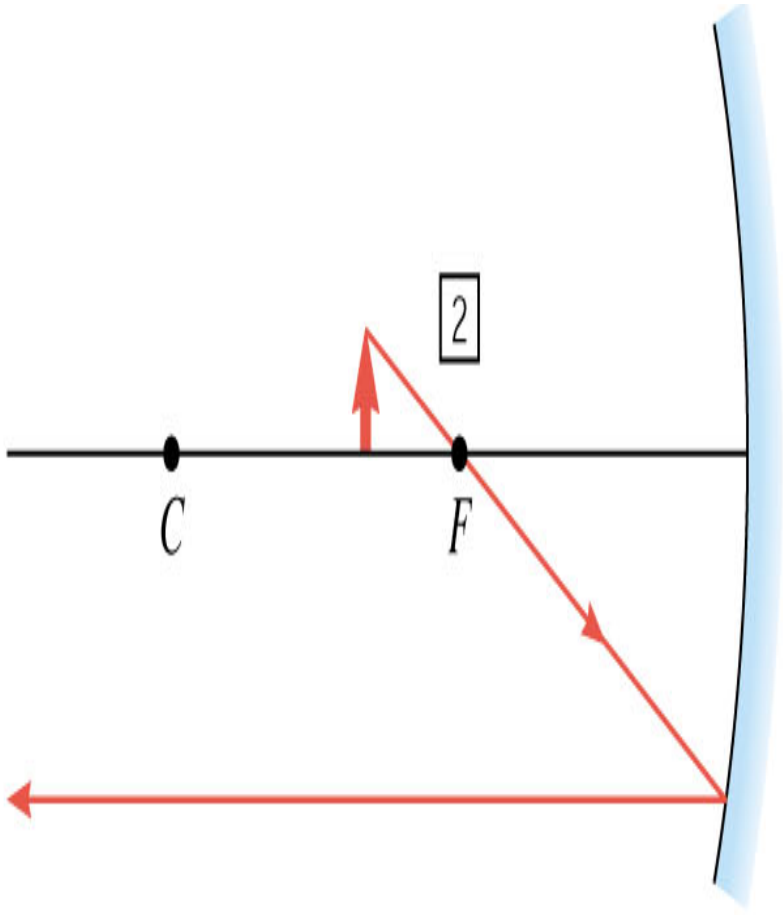


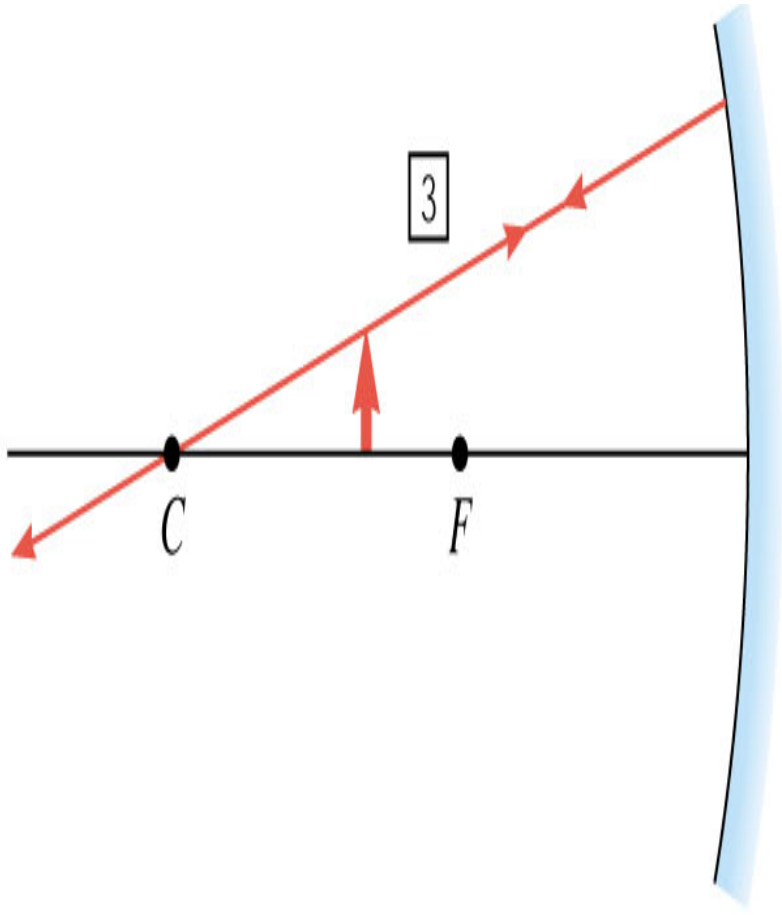
Light rays reflecting off of a convex (diverging) mirror will <u>never</u> create a real image.



How to determine where the real image will appear in a concave (converging) mirror…



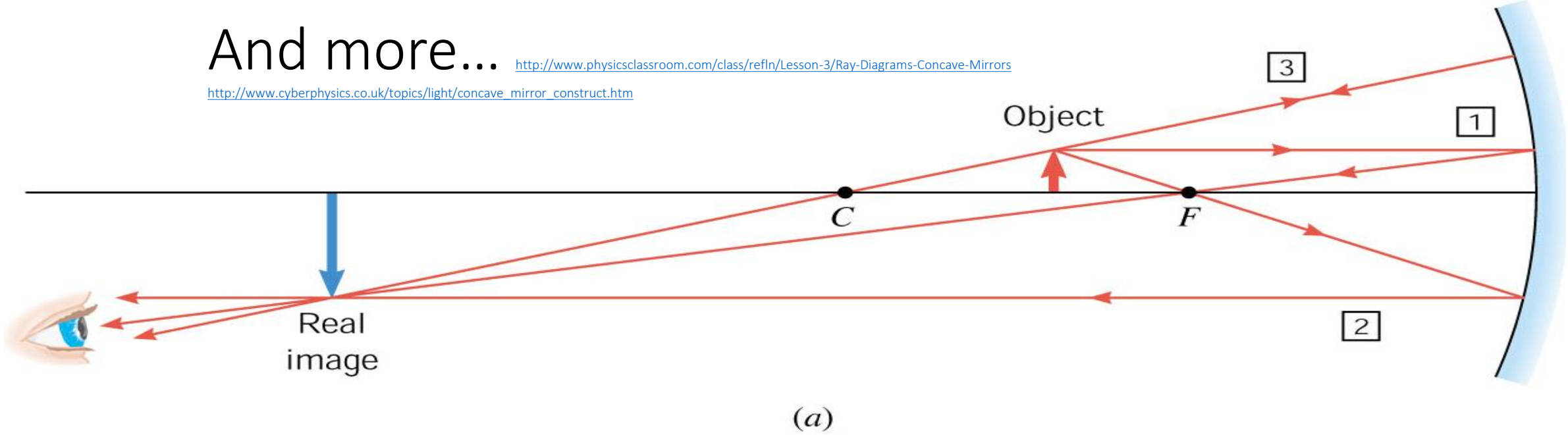




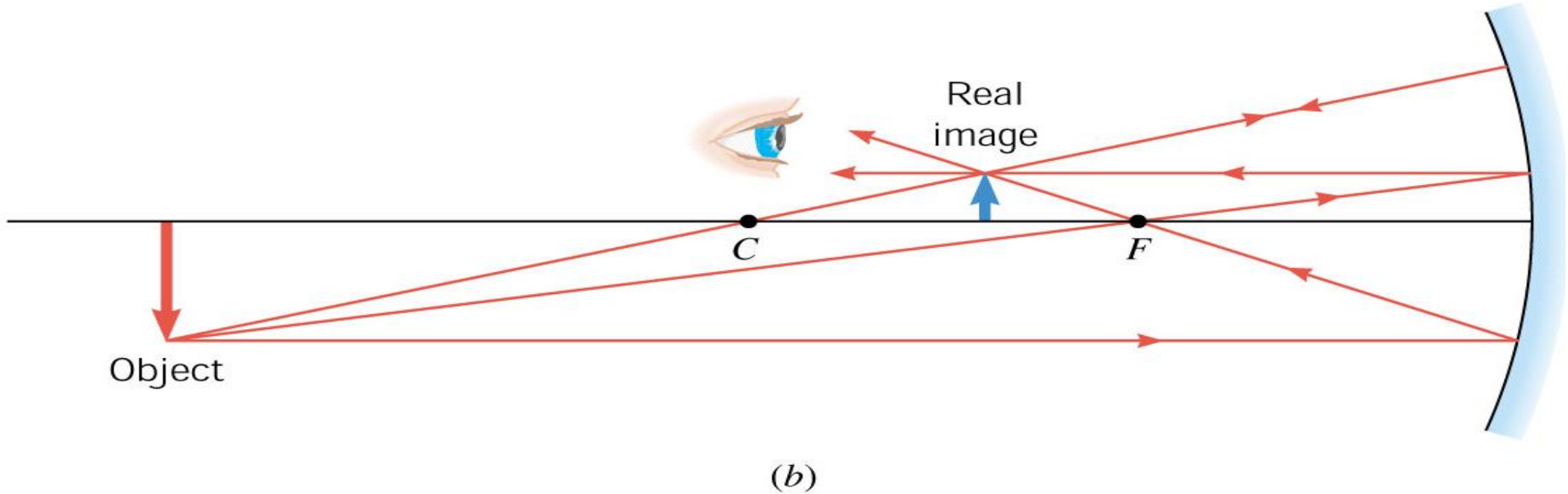
And more…

http://www.physicsclassroom.com/class/refln/Lesson-3/Ray-Diagrams-Concave-Mirrors

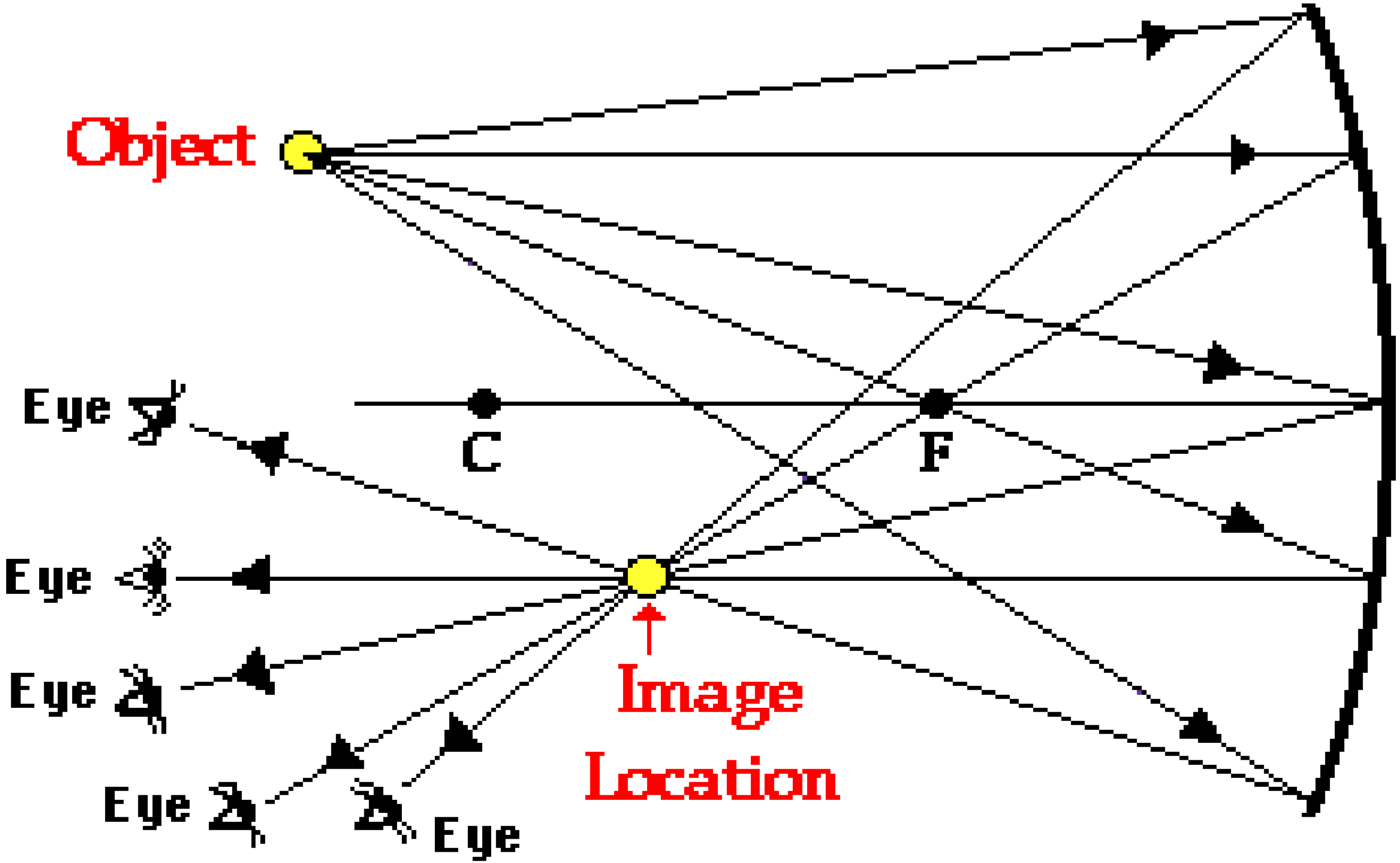
http://www.cyberphysics.co.uk/topics/light/concave_mirror_construct.htm



(a)



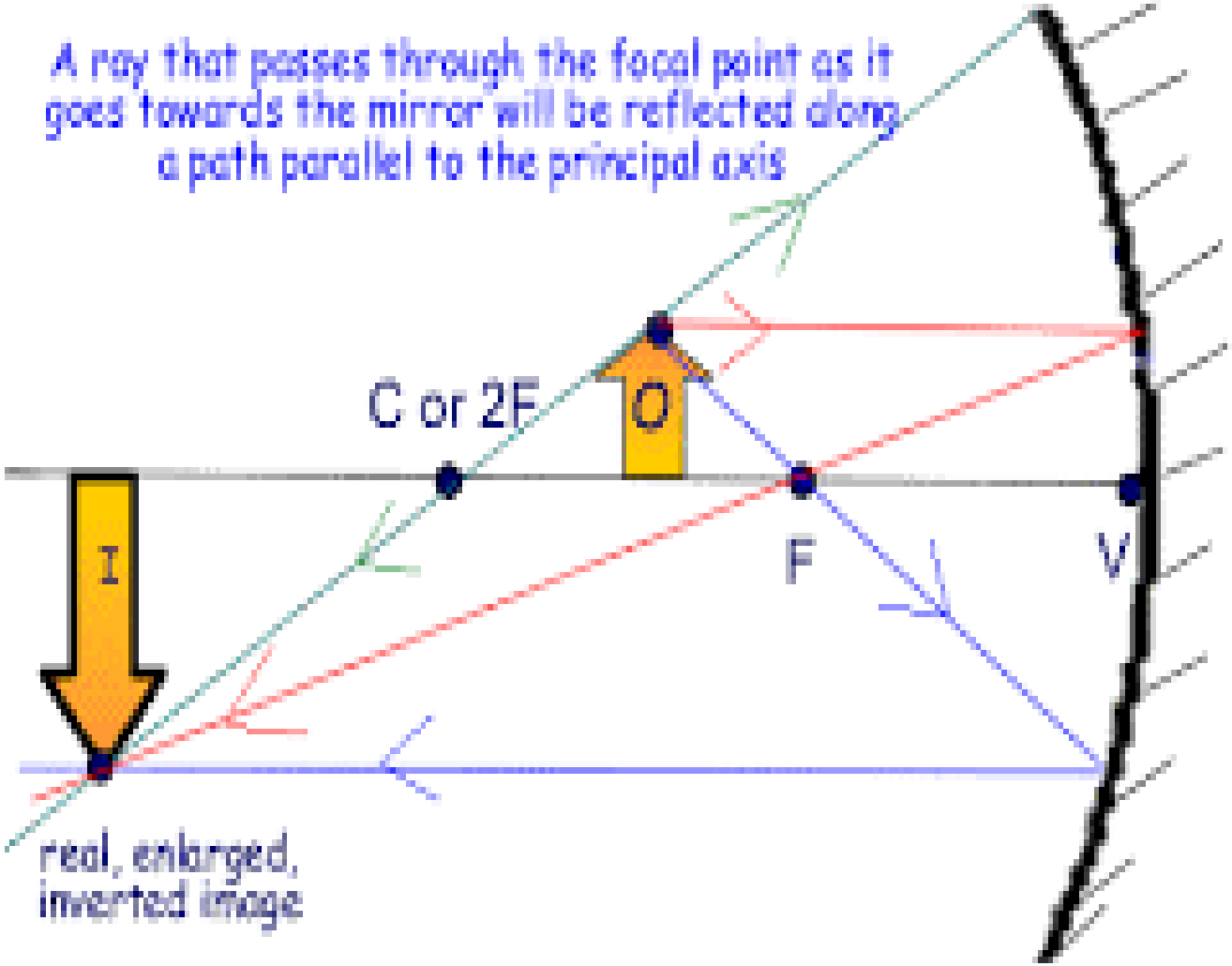
(b)


Object
Eye
C
F
Eye
Eye
Image
Location
Eye
Eye

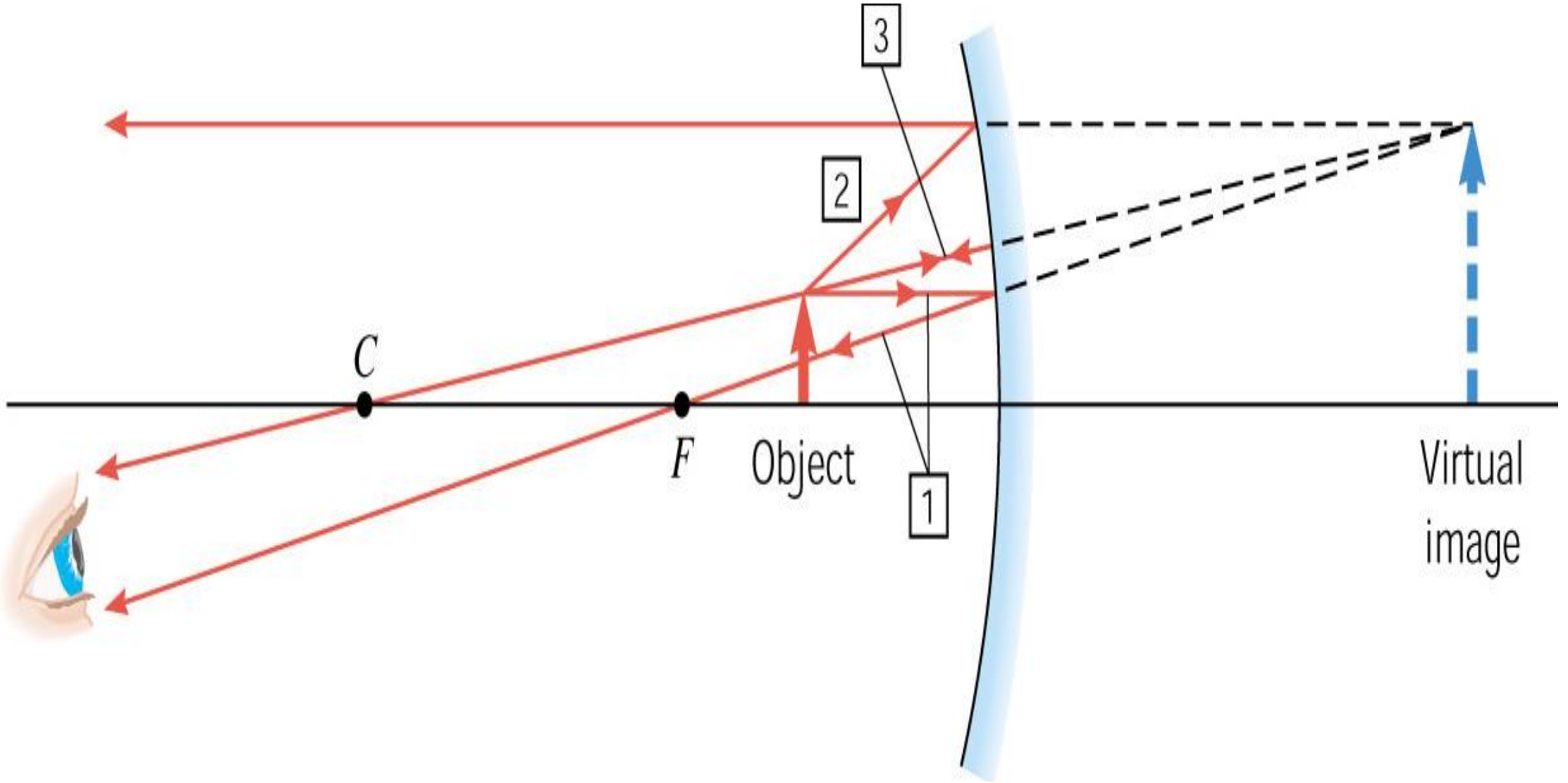
A ray travelling parallel to the principal axis passes through the focal point after reflection by the mirror

A ray that passes through the centre of curvature of the mirror is reflected back along its own path

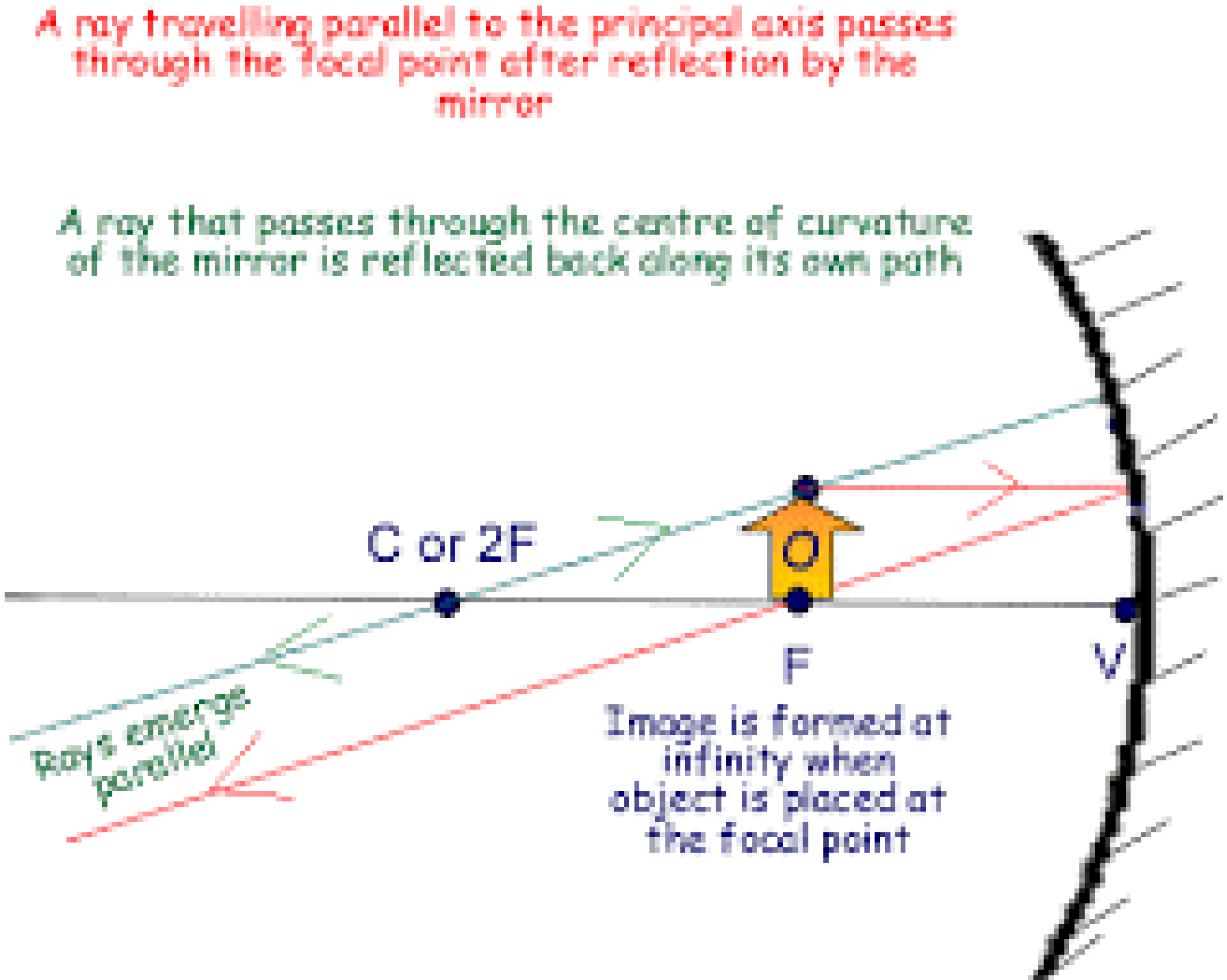
A ray that passes through the focal point as it goes towards the mirror will be reflected along a path parallel to the principal axis



What if the object is in front of F?

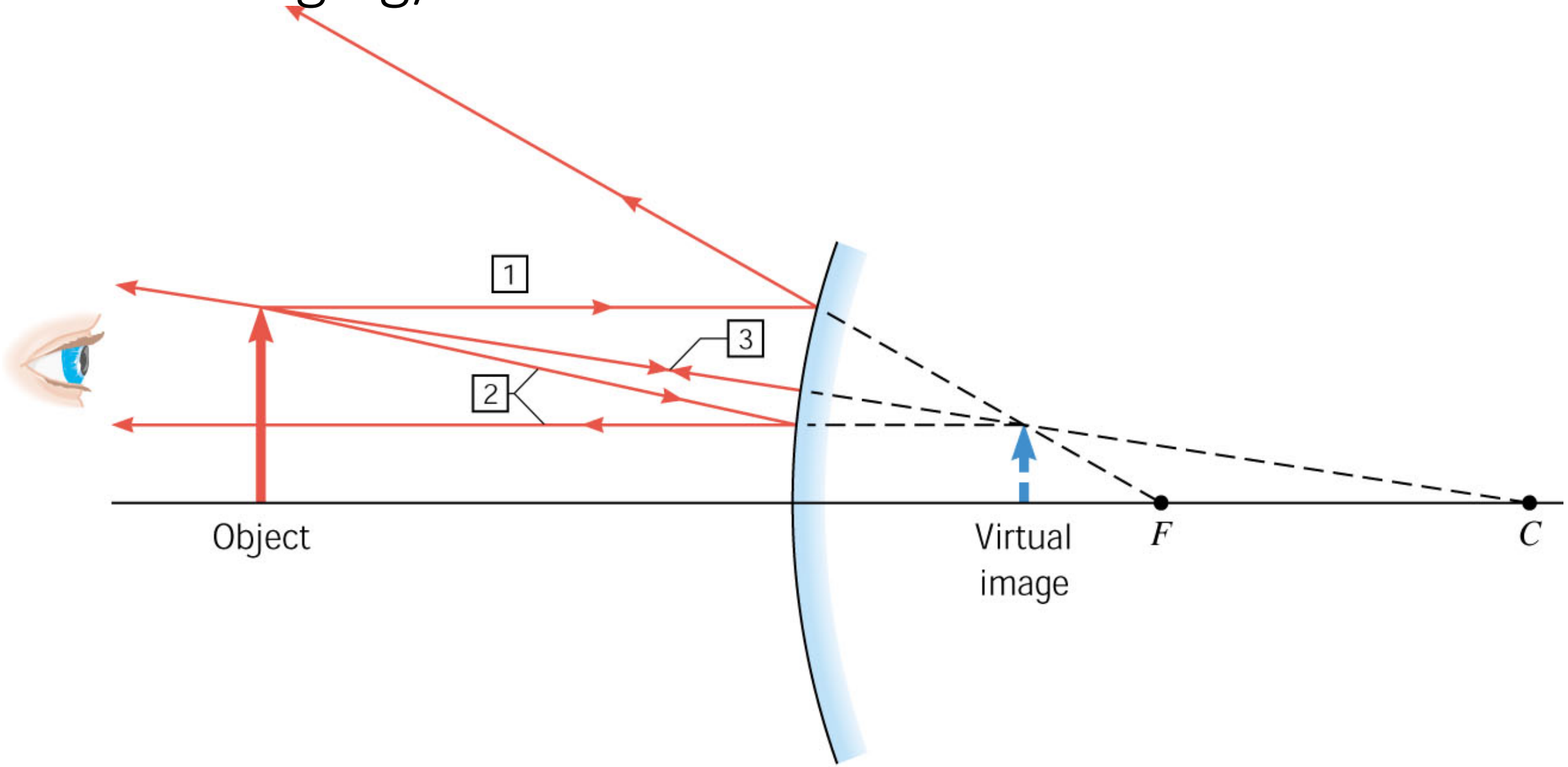


What if the object is at F?



What if the object is placed in front of a diverging/convex mirror?

http://www.acs.psu.edu/drussell/Demos/RayTrace/Mirrors.html



Rear side view mirror in car… Concave or Convex?

Shaving or Make-up Mirror… Concave or Convex? Where is the object placed relative to F?

Curved Mirror Equations… (same as lens eqtn.)

- **Mirror Equation:**

$$1/d_o + 1/d_i = 1/f$$

- **Magnification:**

$$M = h_i/h_o = d_i/d_o$$

- See the yellow shaded box on page 599 for information regarding sign conventions. (d_i is positive for real images and d_i is negative for virtual images.)

- https://phet.colorado.edu/en/simulation/legacy/geometric-optics

Summary of Sign Conventions for Spherical Mirrors

f is + for a concave mirror.

f is – for a convex mirror.

d_o is + if the object is in front of the mirror.

d_o is – if the object is behind the mirror.

d_i is + if the object is in front of the mirror (real image).

d_i is – if the object is behind the mirror (virtual image).

Mirror Sign Convention

$$\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o}$$

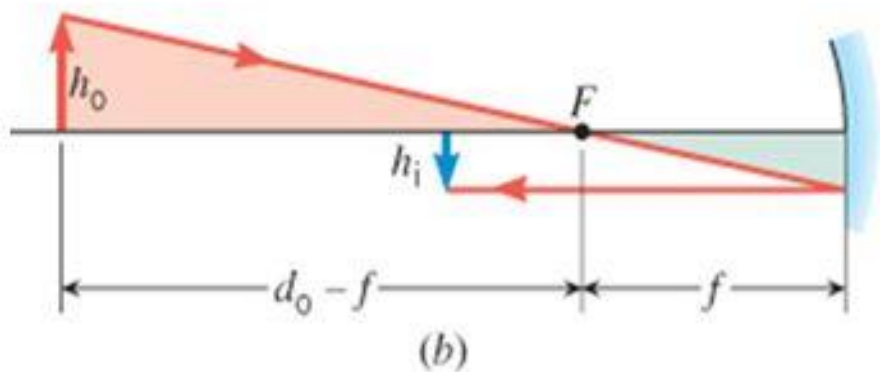
f = focal length

d_i = image distance

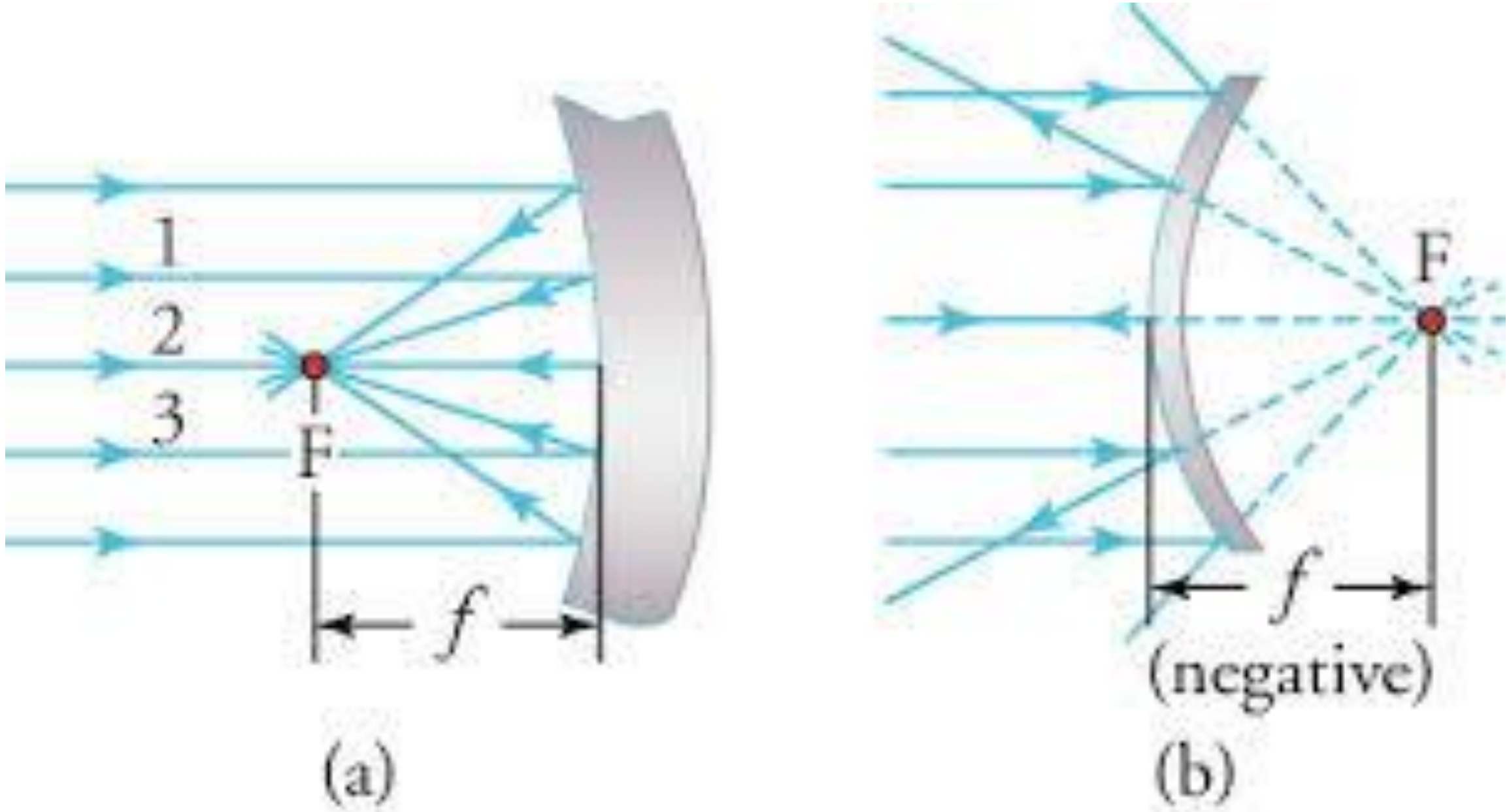
d_o = object distance

d_i
- + for real image
- – for virtual image

f
- + for concave mirrors
- – for convex mirrors



(b)



(a) (b)