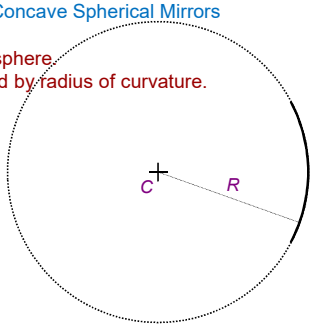
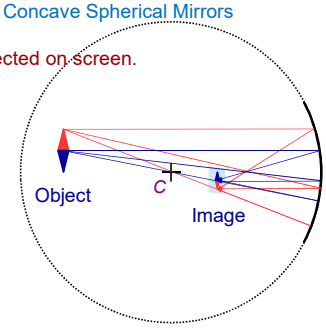
Concave Spherical Mirrors

Portion of a sphere.
Characterized by radius of curvature.

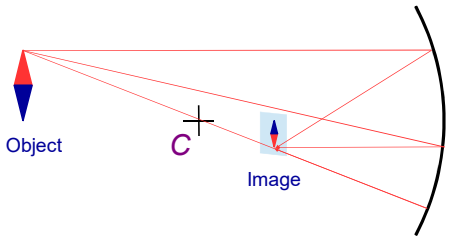


Concave Spherical Mirrors

Image projected on screen.

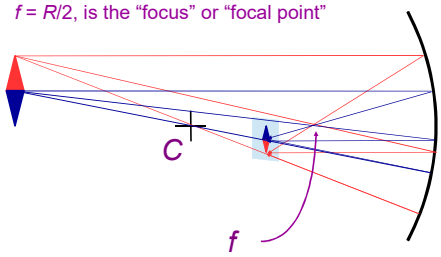


Concave Spherical Mirrors



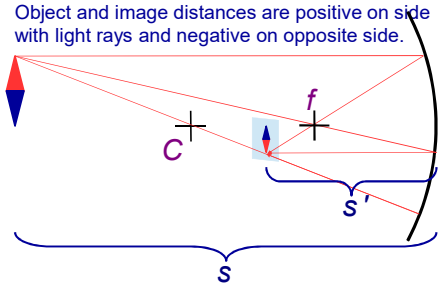
Concave Spherical Mirrors

$f = R/2$, is the "focus" or "focal point"



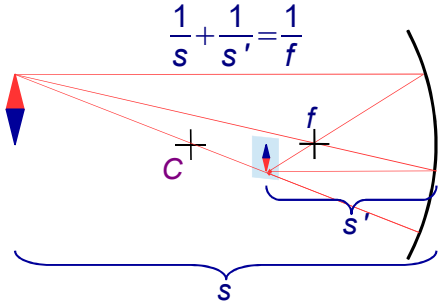
Concave Spherical Mirrors

Object and image distances are positive on side with light rays and negative on opposite side.



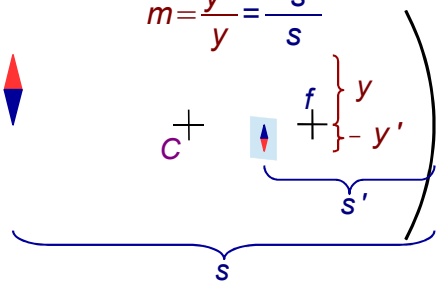
Concave Spherical Mirrors

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



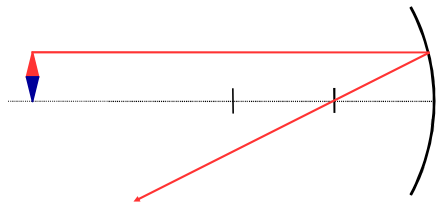
Concave Spherical Mirrors

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



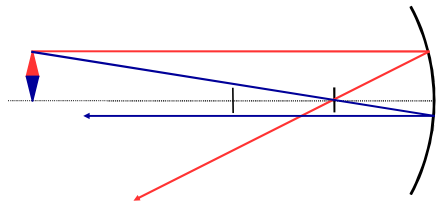
Graphical Determination of Image Location
Draw principle rays

- From object to mirror, parallel to principle axis - From there (mirror) through focus



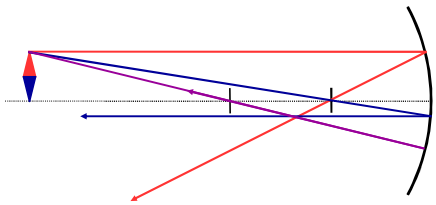
Graphical Determination of Image Location
Draw principle rays

- From object to mirror, through focus - From there (mirror) parallel to principle axis



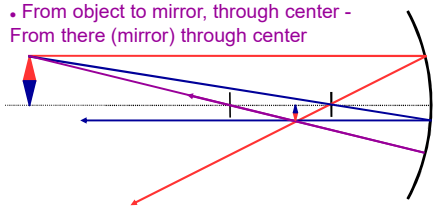
Graphical Determination of Image Location
Draw principle rays

- From object to mirror, through center -
From there (mirror) through center



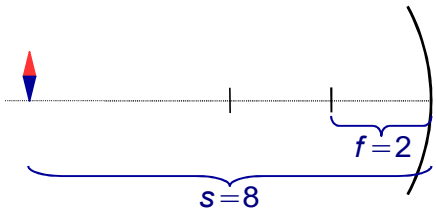
Draw principle rays

- From object to mirror, parallel to principle axis -
From there (mirror) through focus
- From object to mirror, through focus -
From there (mirror) parallel to principle axis
- From object to mirror, through center -
From there (mirror) through center



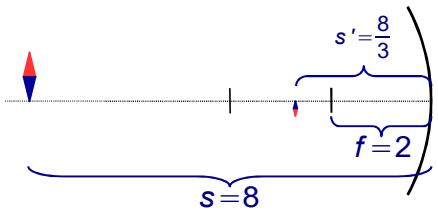
Calculation of Image Location

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



Calculation of Image Location

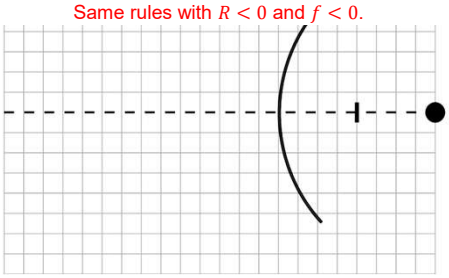
$$\frac{1}{8}+\frac{1}{s'}=\frac{1}{2}$$

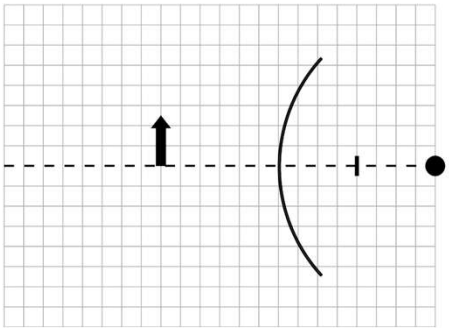


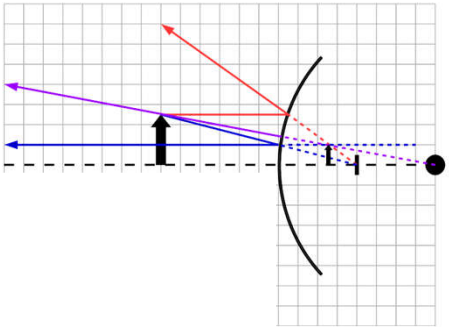
Example: a dime (height is 1.8 cm) is placed 100 cm away from a concave mirror. The image height is 0.9 cm and the image is inverted. What is the focal length of the mirror.

Convex Spherical Mirrors

Same rules with $R < 0$ and $f < 0$.







Convex Spherical Mirrors

Image is virtual, upright, and smaller than object.

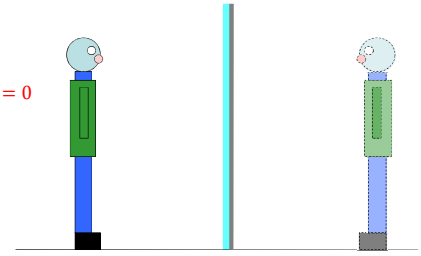
Example: a convex rearview car mirror has a radius of curvature of 40 cm. Determine the location of the image and its magnification for an object 10 m from the mirror.

Plane Mirrors

A plane mirror can be treated as a concave mirror with an infinite radius of curvature.

$$\frac{1}{s}+\frac{1}{s'}=\frac{1}{f}=\frac{2}{R}=\frac{2}{\infty}=0$$

$$s=-s'$$



Additional Examples

An additional file is provided on the lecture web page including each possible type of image due to a concave spherical mirror.