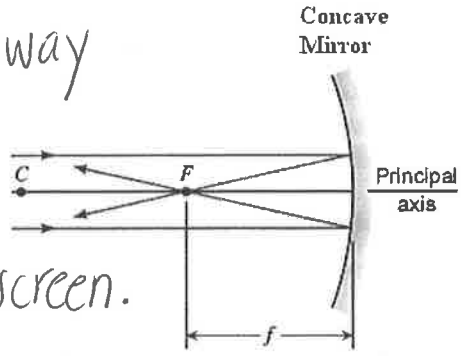
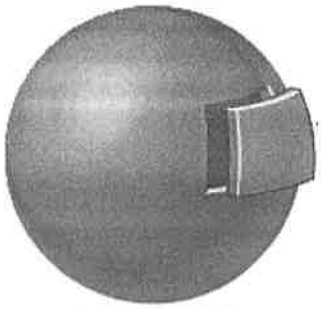
Curved Mirrors

rce of Parallel Rays: very, very far away source



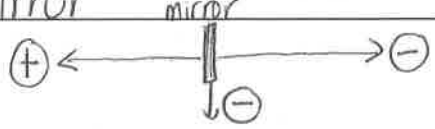


Method of locating focal point: Allow light from a distant object to come into focus on a screen.

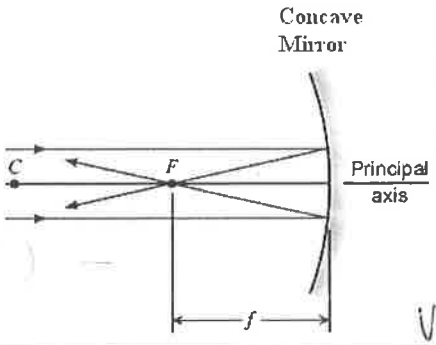
Principal Axis: diameter of sphere
Center of Curvature (C): center of sphere
Radius of Curvature (R): radius of sphere
Focal Point (F): point where rays cross the principal axis
Focal Length (f): distance from focal point to mirror

Relationship between radius of curvature and focal length

R = 2f

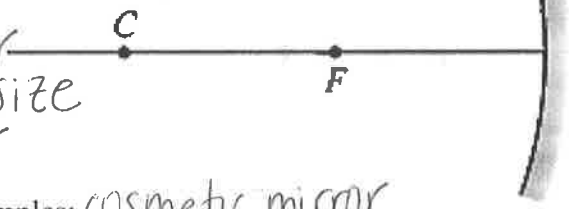


Converging Mirror



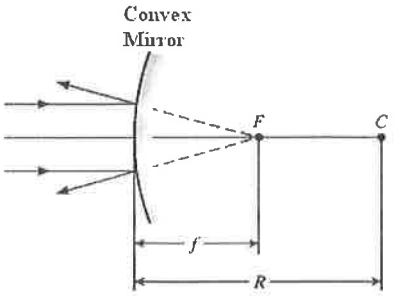
Shape: concave
Focal Point: real
Focal Length: +

Images: real → smaller, same size, larger
no image
virtual image - larger

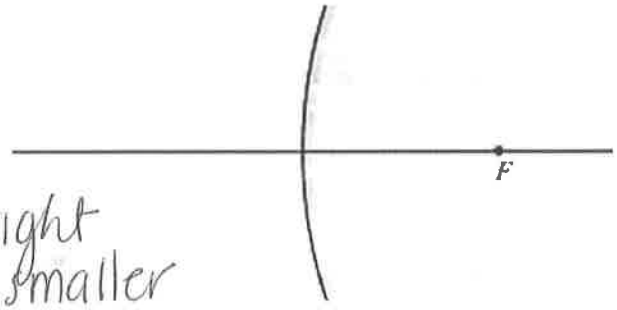


Examples: cosmetic mirror, satellite dish

Diverging Mirror



Shape: convex
Focal Point: virtual
Focal Length: −
Images: virtual - upright + smaller



Examples: rear view mirror, security mirror

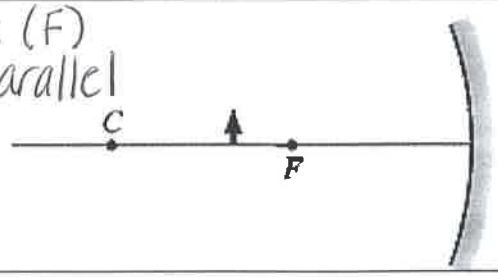
Real and Virtual Images

Real image: formed where light rays actually converge.
Properties:
1) Can be projected on to a screen.
2) Image is always inverted.

Virtual image: formed where light rays appear to converge or intersect.
Properties:
1) Cannot be projected on a screen.
2) Image is always upright.

Ray Tracing (3-Ray diagrams) to Locate Images

Ray #1: In parallel, out through focal pt. (F)
Ray #2: In through focal pt. (F), and out parallel
Ray #3: In center of mirror, out at an equal angle.



object beyond center

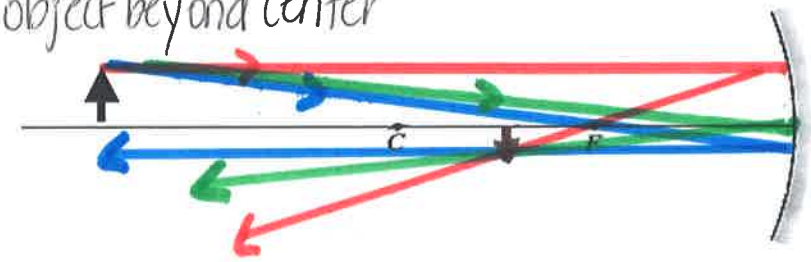


Image Properties
Case 1:
- real
- smaller
- inverted

object at center or at 2f

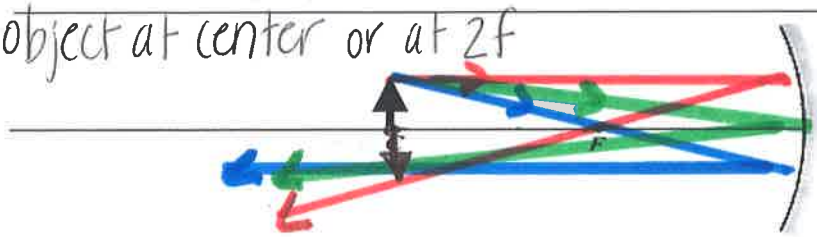


Image Properties
Case 2:
- real
- same size
- inverted

object between "C" and focal pt.

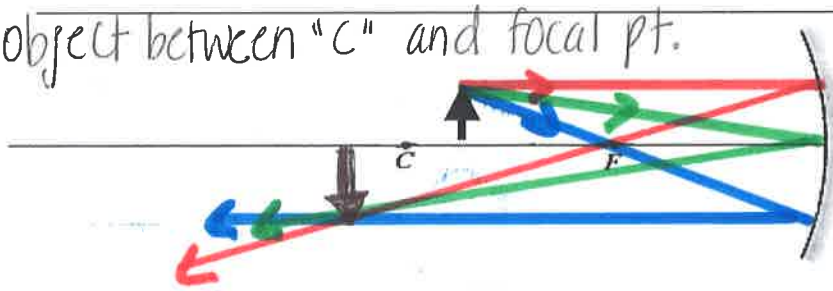


Image Properties
Case 3:
- real
- larger
- inverted

object at focal pt. "F"

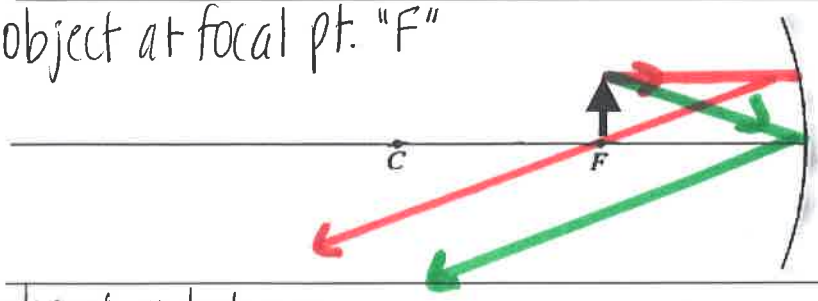


Image Properties
Case 4:
- no image

object is between focal pt. + mirror

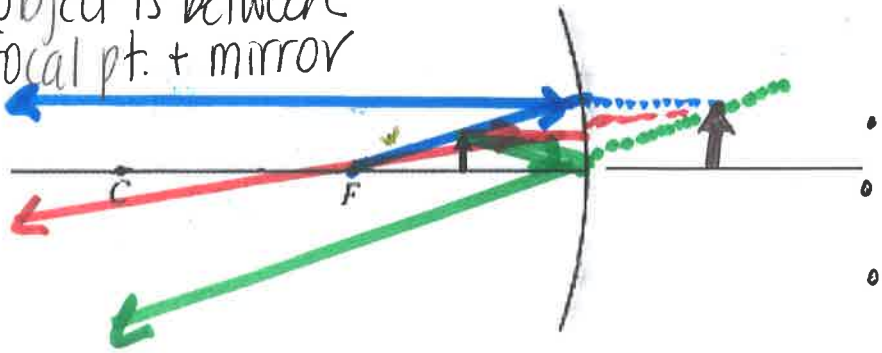
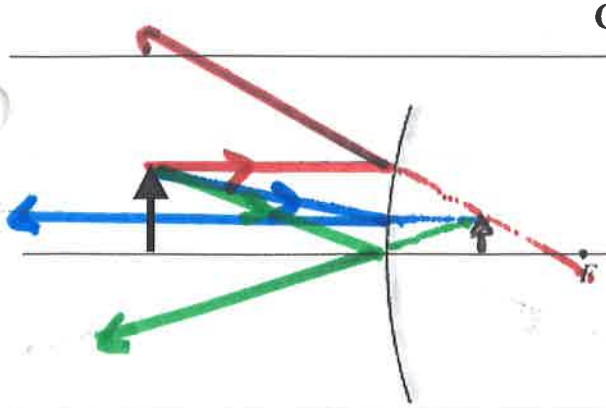


Image Properties
Case 5:
- virtual
- larger
- upright

Application:

Convex Mirror

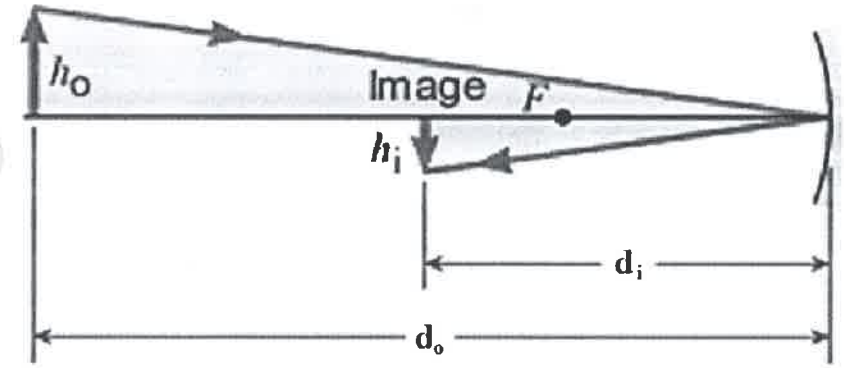


- virtual
- upright
- smaller

Application:

1. Under what circumstances will a mirror form a real image? concave, object outside of F
2. Under what circumstances will a mirror form a virtual image?
convex mirror, plane (flat) mirror, concave (and object inside F)

Calculating Locations and Sizes of Images



d_o (or u) =

d_i (or v) =

h_o =

h_i =

Sign Convention | **Mirror Equation** | **Linear Magnification**

1. A 2.0-cm-high object is placed 7.10 cm from a concave mirror whose radius of curvature is 10.20 cm.

a) Locate the image by means of a ray diagram.

b) Calculate the location of the image.

c) Calculate the magnification of the mirror.

d) Calculate the size of the image.

e) Describe the image.