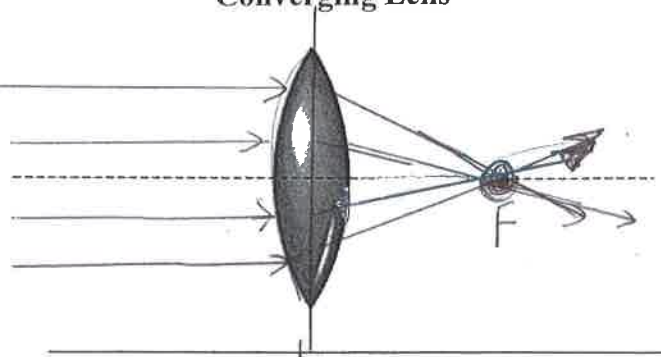
Lenses

Why do lenses converge or diverge light? Because there is refraction of light at each surface

How can the focal length of a converging lens be found? Allow light from a distant source to focus on a screen and measure the distance from the lens to screen.

Converging Lens



Shape: convex

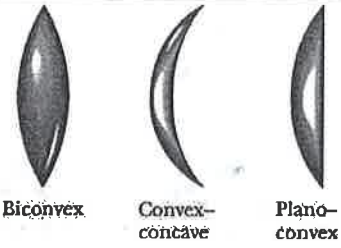
Focal Point: real

Focal Length: (+)

Images: real ⇒ larger / same size / smaller

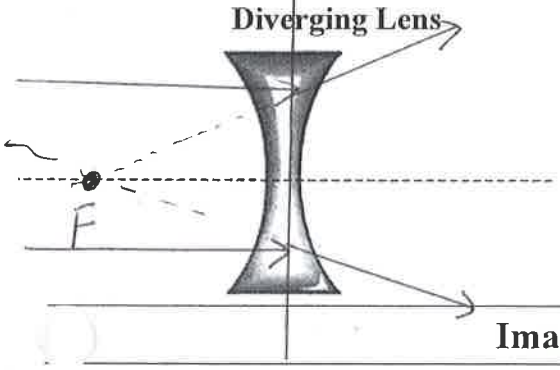
no image

virtual image - larger



Converging lenses are . . . thicker in the middle

Diverging Lens

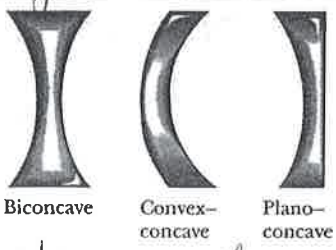


Shape: concave

Focal Point: virtual

Focal Length: (−)

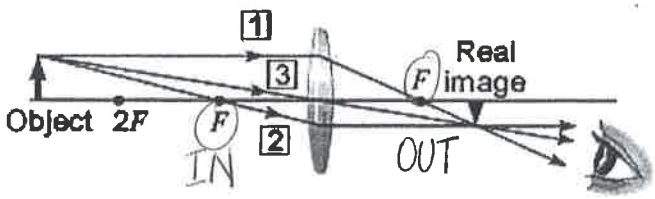
Images: virtual; smaller + upright



thinner in the middle

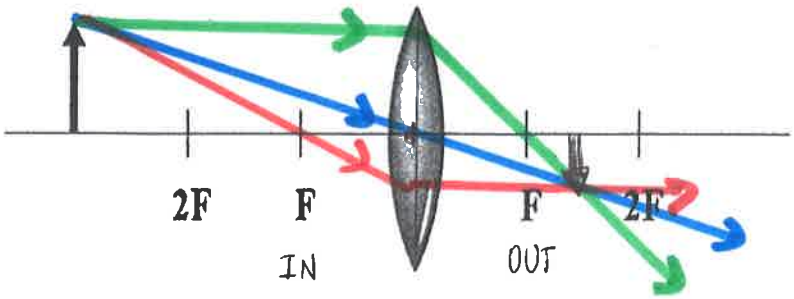
Image Formation by Converging Lenses

Sample of a ray diagram used to locate and describe image



Three Principal Rays used in Ray Diagramming

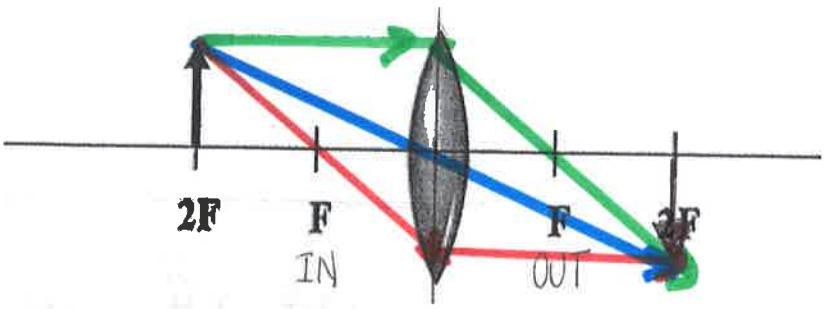
1. In parallel, out through F_{OUT}
2. In through F_{IN}, out parallel
3. In center, out center (of lens)



Case 1 Object Beyond 2F

Properties of image:

- inverted
- real
- smaller

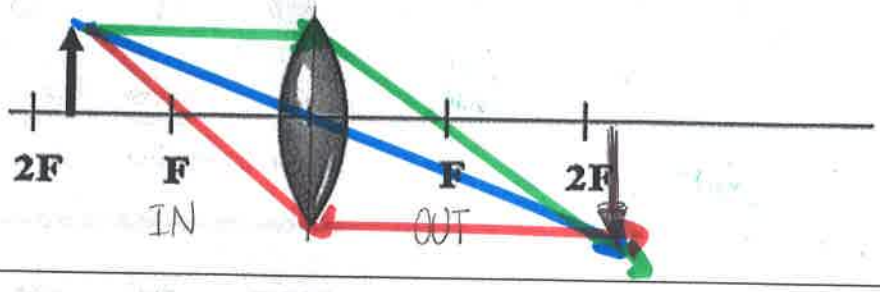


Object at 2F

Case 2

Properties of image:

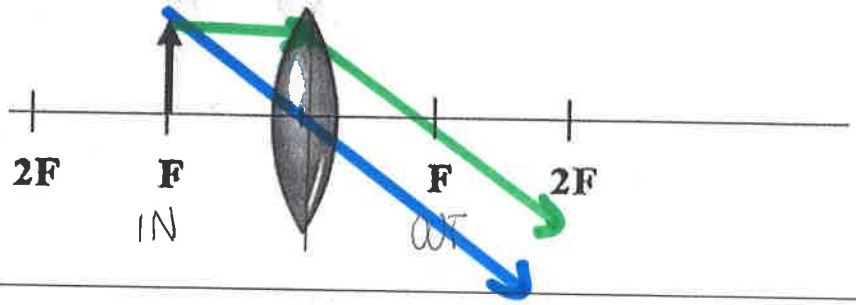
same size
real
inverted



Case 3 Object between 2F & F

Properties of image:

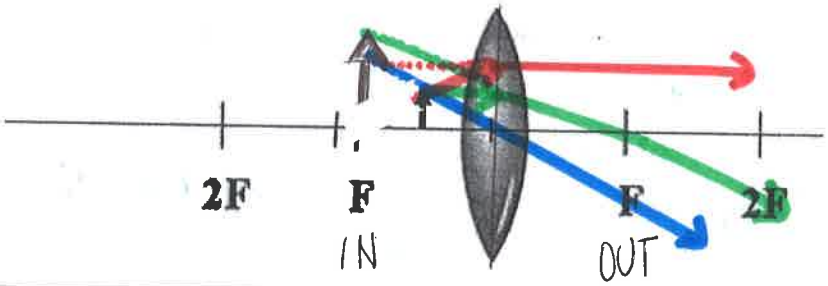
larger
real
inverted



Case 4 Object at F

Properties of image:

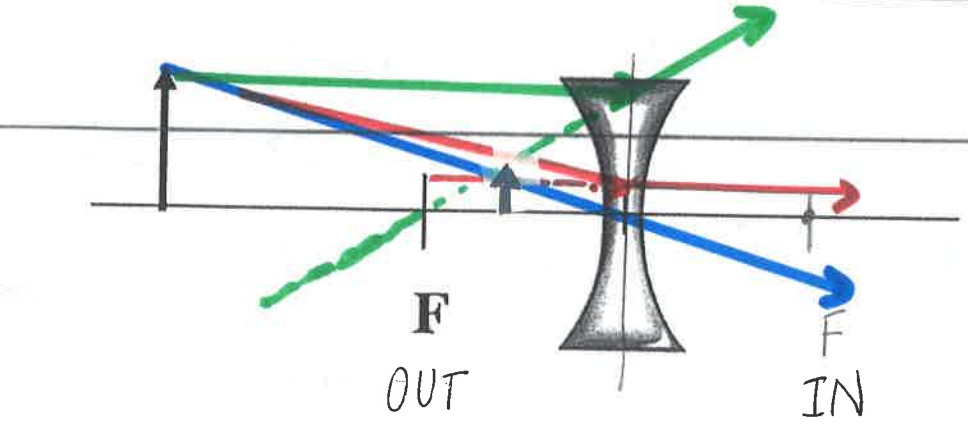
no image



Case 5 Object inside F

Properties of image:

larger
virtual
upright



Case 6

Properties of image:

smaller
virtual
upright

F_{IN} & F_{OUT} are flipped for diverging lens