Thin Lenses

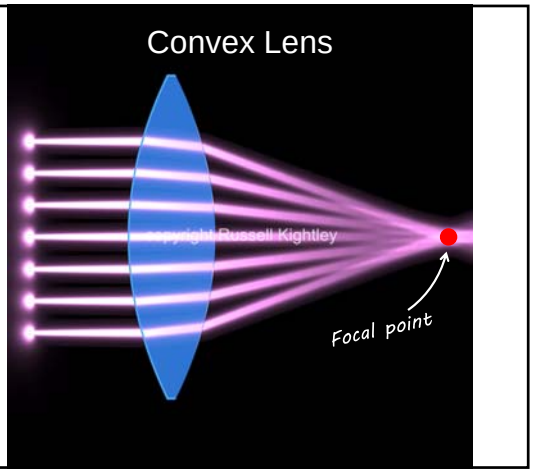
Lenses

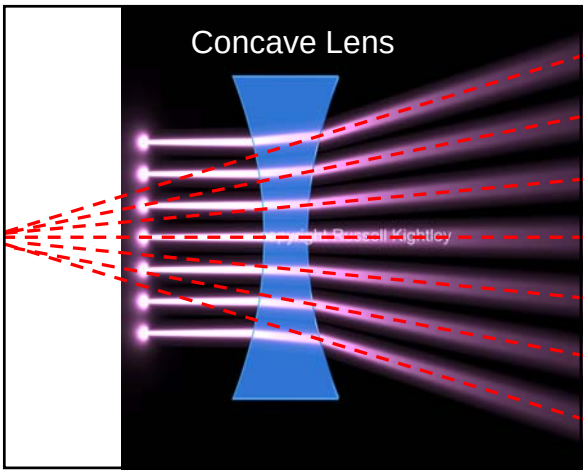
- Lenses refract light rather than reflect light.
- The ideas and principles of ray optics used with mirrors also apply to lenses except refraction laws are used rather than reflection laws.
- Lenses can create both real and virtual images that are either reduced or enlarged depending upon the location of the object.
- A lens has two sides and two focal lengths on either side of the lens.

Types of Lenses

1.) *Convex* (converging) lenses refract light rays initially parallel to the principal axis so that the rays converge to a focal point located on the other side of the lens.

2.) *Concave* (diverging) lenses refract light rays initially parallel to the principal axis so that the rays appear to diverge from a focal point on the same side of the lens as the object.



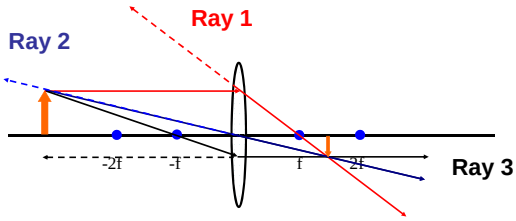


Ray Diagrams Lenses

To draw ray diagrams for lenses use two of the following rays:

1. From the tip of the object horizontally toward the lens, refracting through the focal point . . . extend the virtual ray behind (on the left side) of the lens.
2. From the tip of the object straight through the center of the lens . . . extend the virtual ray behind the lens.
3. From the tip of the object through the opposite f, refracting horizontally . . . extend the virtual ray behind the lens.

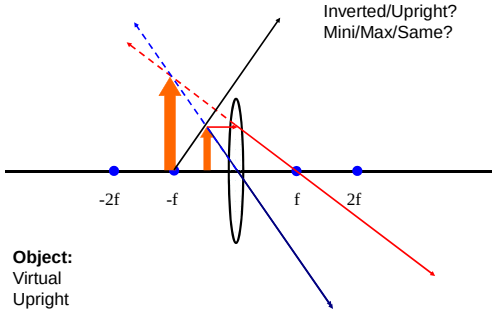
Convex lenses:
Converge light
Have + focal points



Object:
Real
Inverted
Minimized

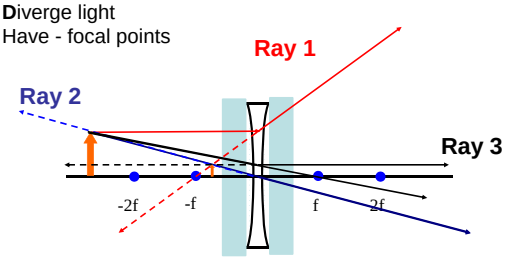
Practice

Object:
Real/Virtual?
Inverted/Upright?
Mini/Max/Same?



Object:
Virtual
Upright
Maximized

Concave Lenses:
Diverge light
Have - focal points



Object:
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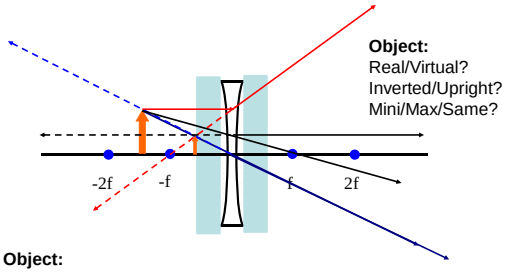

Object:
Virtual
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