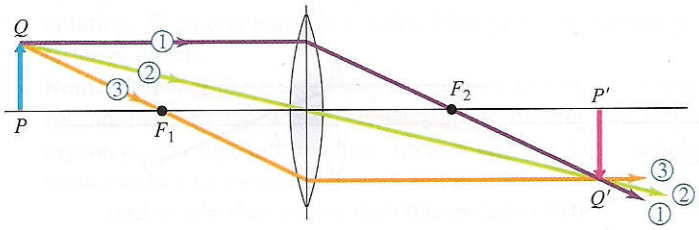
Graphical method for finding image height, orientation, and location.

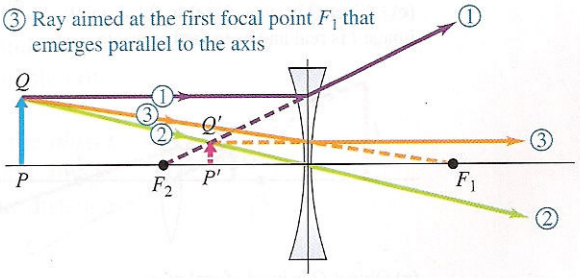
Case 1: Lenses

① Parallel incident ray refracts to pass through second focal point F_2
② Ray through center of lens (does not deviate appreciably)
③ Ray through the first focal point F_1 that emerges parallel to the axis



(a) Converging lens

① Parallel incident ray appears after refraction to have come from the second focal point F_2
② Ray through center of lens (does not deviate appreciably)
③ Ray aimed at the first focal point F_1 that emerges parallel to the axis

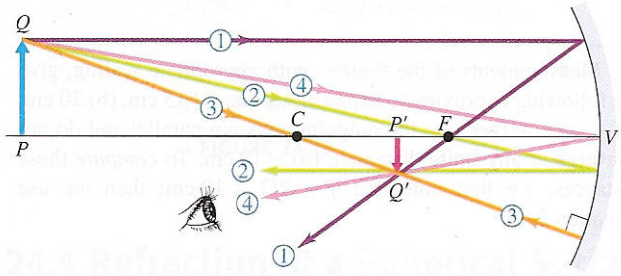


(b) Diverging lens

▲ **FIGURE 24.36** Principal-ray diagrams showing the graphical method for locating an image produced by a thin lens.

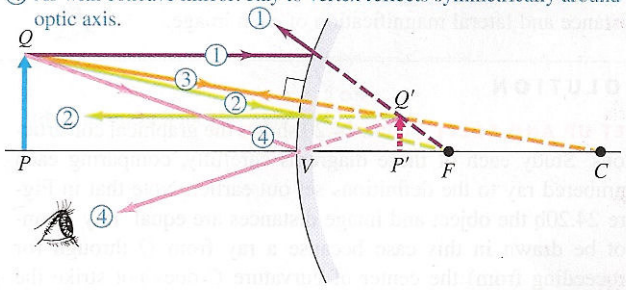
Case 2: Mirrors

① Ray parallel to axis reflects through focal point.
② Ray through focal point reflects parallel to axis.
③ Ray through center of curvature intersects the surface normally and reflects along its original path.
④ Ray to vertex reflects symmetrically around optic axis.



(a) Principal rays for concave mirror

① Reflected parallel ray appears to come from focal point.
② Ray toward focal point reflects parallel to axis.
③ As with concave mirror: Ray radial to center of curvature intersects the surface normally and reflects along its original path.
④ As with concave mirror: Ray to vertex reflects symmetrically around optic axis.



(b) Princpal rays for convex mirror

▲ **FIGURE 24.19** Principal-ray diagrams for concave and convex mirrors. To find the image point Q, we draw any two of these rays; the image point is located at their intersection.