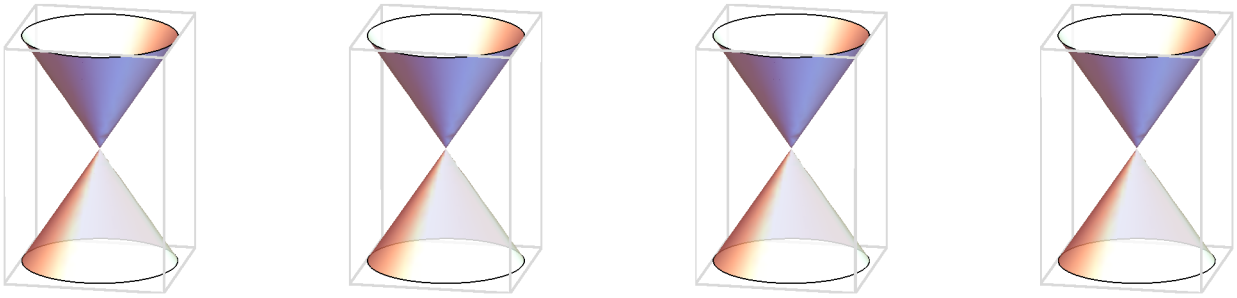
10.1 The Parabola

Conic Sections

The conic sections are created by slicing a double cone with a plane at various angles. The conic sections are the circle, ellipse, parabola, and hyperbola



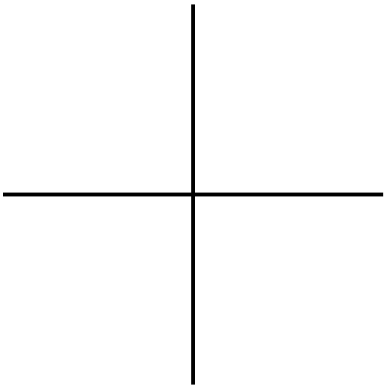
Back in chapter 1 we looked at the equation of a circle, and the geometrical description of circles:

A **circle** is the set of all points (x, y) equidistant from a fixed point (h, k). If r is the equal distance, then $\sqrt{(x-h)^2+(y-k)^2} = r$, or $(x-h)^2+(y-k)^2 = r^2$, where r is the radius and (h, k) is the center.

The Parabola

A **parabola** is the set of all points (x, y) equidistant from a fixed point p and a fixed line l. The fixed point is call the *focus*, and the fixed line is called the *directrix*.

Example 1 Plot the point $(0, p)$ and the line $y = -p$, and derive the equation of the parabola from the definition.



Example 2 Find the focus, directrix, and the length of the *latus rectum*, for the parabola given by $y = \frac{1}{12}x^2$.

Example 3 A parabola has it's vertex at the origin with directrix $x = 2$. Find the equation of the parabola.

Example 4 A telescope has a 20-centimeter diameter parabolic mirror and needs a 1.2-meter focal length. Find the depth, in millimeters, the mirror needs to be ground down at the center.

Example 5 Suppose the furthest distance a baseball player can hit a ball is 420-ft. What is the maximum height for the ball if it is hit straight up?