

General Form

$$Ax^2 + By^2 + Cx + Dy + E = 0$$

Parabola x or y is squared, but not both

Circle x^2 & y^2 have the same coefficient

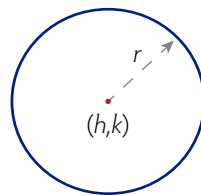
Ellipse x^2 & y^2 have the same signs

Hyperbola x^2 & y^2 have different signs

Circle

$$(x - h)^2 + (y - k)^2 = r^2$$

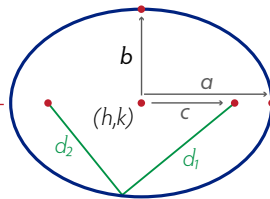
- eccentricity = 0



Ellipse

$$\frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} = 1$$

- The semi-major axis is the larger of a or b .
- $d_1 + d_2 = 2(\text{semi-major axis})$
- $c^2 = |a^2 - b^2|$
- $0 < \text{eccentricity} < 1$ (closer to 0 means rounder)



Terminology

- c Distance to the **focus** (plural: *foci*)
- Long axis **Major axis**
- Long radius **Semi-major axis**
- Short axis **Minor axis**
- Short radius **Semi-minor axis**

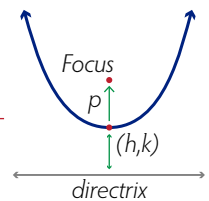
What's Eccentricity? $e = \frac{c}{\text{semi-major axis}}$

Parabola

Vertical $(x - h)^2 = 4p(y - k)$

Horizontal $(y - k)^2 = 4p(x - h)$

- p is the distance from the vertex to the focus.
- The directrix and focus are the same distance from the vertex.
- eccentricity = 1



Hyperbola

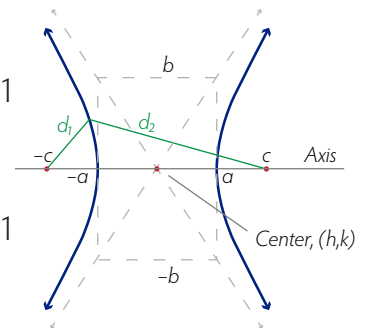
Centered at $(0,0)$

Horizontal axis

$$\frac{(x - h)^2}{a^2} - \frac{(y - k)^2}{b^2} = 1$$

Vertical axis

$$\frac{(y - k)^2}{b^2} - \frac{(x - h)^2}{a^2} = 1$$



Asymptotes

$$y = \pm \frac{b}{a}(x - h) + k$$

Notes

- Vertical if y is positive
Horizontal if x is positive
- $c^2 = a^2 + b^2$