Acumen Tutoring™

Precalculus Memorize Me™

Conic Sections

General Form

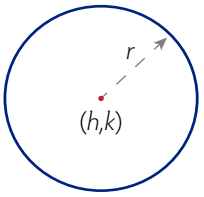
$Ax^2 + By^2 + Cx + Dy + E = 0$

Parabola	x or y is squared, but not both	*Ellipse*	x^2 & y^2 have the same signs
Circle	x^2 & y^2 have the same coefficient	*Hyperbola*	x^2 & y^2 have different signs

Circle

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

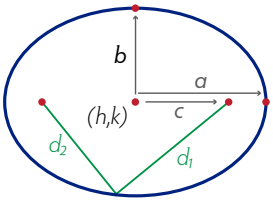
- eccentricity = 0



Ellipse

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

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



- a is always the larger number (and therefore the longer axis).
- $d_1 + d_2$ is a constant
- $c^2 = a^2 - b^2$
- 0 < eccentricity < 1

Terminology

- c & $-c$ — Distance to the focus (plural: *foci*)
- Long axis — Major axis
  a — Major radius, semi-major axis
- Short axis — Minor axis
  b — Minor radius, semi-minor axis

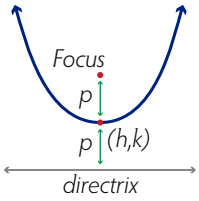
What's Eccentricity? $e = \frac{c}{a}$

Parabola

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

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

- Vertex → focus = Vertex → directrix
- eccentricity = 1



Hyperbola

Horizontal axis

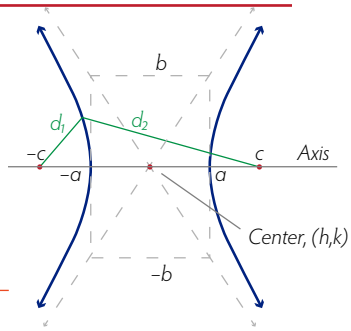
$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$

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

Vertical axis

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

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



The slope is always the y radius over the x radius.

Notes

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