

Shell Tutorial Center

Conics

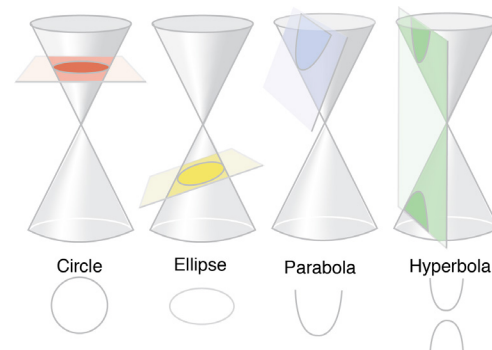
Recognizing Conics from their equations:

Circle: Both variables squares and squared terms have the same coefficients.

Parabola: Only one variable is squared

Ellipse: Both variables squared and squares terms have the same sign but different coefficients.

Hyperbola: Both variables squared and squared terms have coefficients with opposite signs.



Circles

Equation	Standard Form	$(x - h)^2 + (y - k)^2 = r^2$
	General Form	$x^2 + y^2 + ax + by + c = 0$
	Center	(h, k)
	Radius	r

Parabolas

$(x - h)^2 = 4p(y - k)$	Equation	$(y - k)^2 = 4p(x - h)$
$x^2 + Dx + Ey + F = 0$	General Form	$y^2 + Dx + Ey + F = 0$
$x = h$	Axis of Symmetry	$y = k$
(h, k)	Vertex	(h, k)
$(h, k + p)$	Focus	$(h + p, k)$
$y = k - p$	Directrix	$x = h - p$
$4p > 0$ up $4p < 0$ down	Direction of Opening	$4p > 0$ Right $4p < 0$ Left
Length of latus rectum : $ 4p $		

Ellipse

$\frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} = 1$	Equation General Form $Ax^2 + Cy^2 + Dx + Ey + F = 0$	$\frac{(x - h)^2}{b^2} + \frac{(y - k)^2}{a^2} = 1$
(h, k)	Center	(h, k)
$(h + c, k)$ & $(h - c, k)$	Foci	$(h, k + c)$ & $(h, k - c)$
Horizontal $2a$	Major Axis	Vertical $2a$
Vertical $2b$	Minor Axis	Horizontal $2b$
$(h + a, k)$ & $(h - a, k)$	Endpoints of Major Axis	$(h, k + a)$ & $(h, k - a)$
$(h, k + b)$ & $(h, k - b)$	Endpoints of Minor Axis	$(h + b, k)$ & $(h - b, k)$
$2c$	Distance between Foci $a^2 > b^2$ $c^2 = a^2 - b^2$	$2c$

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Hyperbola

$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$	Equation General Form $Ax^2 + Cy^2 + Dx + Ey + F = 0$	$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$
(h, k)	Center	(h, k)
$(h + c, k)$ & $(h - c, k)$	Foci	$(h, k + c)$ & $(h, k - c)$
$(h + a, k)$ & $(h - a, k)$	Vertices	$(h, k + a)$ & $(h, k - a)$
Horizontal $2a$	Transverse Axis	Vertical $2a$
Vertical $2b$	Conjugate Axis	Horizontal $2b$
Left & Right	Direction of Opening	Up and Down
$2c$	Distance between Foci $c^2 = a^2 + b^2$	$2c$
$y - k = +\frac{b}{a}(x - h)$	Asymptote equations	$y - k = +\frac{a}{b}(x - h)$