

## Conic Sections In Standard Form

	Circles	Parabolas	Ellipses	Hyperbolas
<b>Horizontal:</b>				
Equation	$(x-h)^2 + (y-k)^2 = r^2$	$x = a(y-k)^2 + h$	$(x-h)^2/a^2 + (y-k)^2/b^2 = 1$	$(x-h)^2/a^2 - (y-k)^2/b^2 = 1$
Center	(h, k)		(h, k)	(h, k)
Axis Of Symmetry	Any Diameter	$y = k$	See "a" and "b"	See "a" and "b"
Focus (Foci)	(h, k) center is focus	$(h+1/(4a), k)$	$(h+c, k)$ & $(h-c, k)$	$(h+c, k)$ & $(h-c, k)$
Directrix		$x = h - 1/(4a)$		
Vertex (Vertices)		(h, k)	$(h+a, k), (h-a, k),$ $(h, k+b), (h, k-b)$	$(h+a, k), (h-a, k)$
Asymptotes				$y = \pm(b/a)(x-h)+k$
Variables	$r = \text{radius}$		$a = \text{semi-major axis}$ $b = \text{semi-minor axis}$	$a = \text{semi-transverse axis}$ $b = \text{semi-conjugate axis}$
Note:			$a^2 > b^2$	
"c" is equal to...			$\sqrt{a^2 - b^2}$	$\sqrt{a^2 + b^2}$
Eccentricity:	$e = 0$	$e = 1$	$e = c/a; 0 < e < 1$	$e = c/a; e > 1$
<b>Vertical:</b>				
Equation	$(x-h)^2 + (y-k)^2 = r^2$	$y = a(x-h)^2 + k$	$(x-h)^2/b^2 + (y-k)^2/a^2 = 1$	$(y-k)^2/a^2 - (x-h)^2/b^2 = 1$
Center	(h, k)		(h, k)	(h, k)
Axis Of Symmetry	Any Diameter	$x = h$	See "a" and "b"	See "a" and "b"
Focus (Foci)	(h, k) center is focus	$(h, k+1/(4a))$	$(h, k+c)$ & $(h, k-c)$	$(h, k+c)$ & $(h, k-c)$
Directrix		$y = k - 1/(4a)$		
Vertex (Vertices)		(h, k)	$(h+b, k), (h-b, k),$ $(h, k+a), (h, k-a)$	$(h, k + a), (h, k - a)$
Asymptotes				$y = \pm(a/b)(x-h)+k$
Variables	$r = \text{radius}$		$a = \text{semi-major axis}$ $b = \text{semi-minor axis}$	$a = \text{semi-transverse axis}$ $b = \text{semi-conjugate axis}$
Note:			$a^2 > b^2$	
"c" is equal to...			$\sqrt{a^2 - b^2}$	$\sqrt{a^2 + b^2}$
Eccentricity:	$e = 0$	$e = 1$	$e = c/a; 0 < e < 1$	$e = c/a; e > 1$

For Rectangular Hyperbolas See the Lecture Notes in your packet or on the Web:

[http://www.lcusd.net/lchs/dclausen/algebra2/rectangular\\_hyperbolas.htm](http://www.lcusd.net/lchs/dclausen/algebra2/rectangular_hyperbolas.htm)

**Distance Formula:**

$$\text{distance} = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

**Midpoint Formula:**

$$\left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

**Conic Sections in General Form:  $Ax^2 + By^2 + Cx + Dy + E = 0$** **Circles:**

For Circles  $A = B$

$A$  &  $B$  need to have the same number and same sign.

**Parabolas:**

If either  $A = 0$  or  $B = 0$  then the equation defines a parabola ( $x^2$  or  $y^2$  is missing). Isolate the variable that is not squared and use the completing the square method to convert the equation to that of a Parabola in Standard Form.

Hint: Solve for  $y$  if there is no  $y^2$  in the equation or solve for  $x$  if there is no  $x^2$  in the equation.

**Ellipses:**

- 1)  $A$  &  $B$  have the same sign (both positive or both negative)
- 2)  $A$  &  $B$  are different numbers (if they were the same, this would be a circle).

**Hyperbolas:**

- 1)  $A$  &  $B$  must have different signs (one positive and the other negative).
- 2)  $A$  &  $B$  must be different numbers or opposites (same number with different signs)