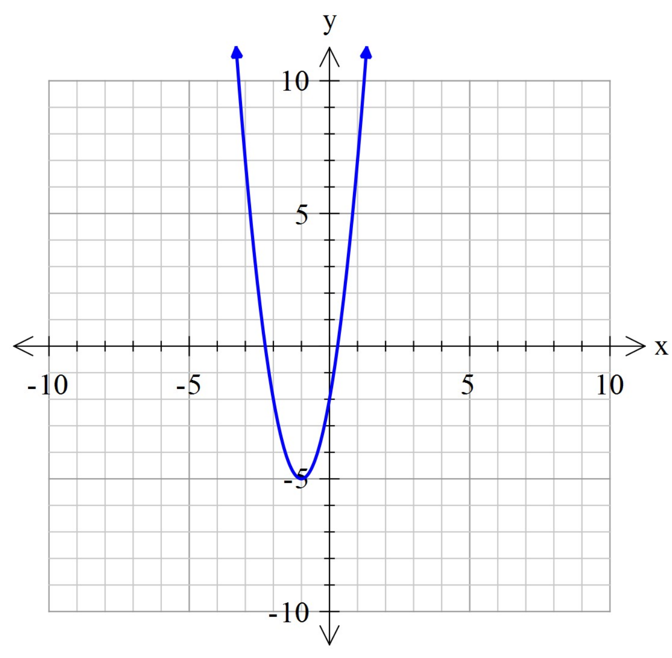
Conic Sections in standard form

Parabola (vertical) : One variable is squared (x) and one variable is linear (y).

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

The vertex is found at (h, k).

Example:
$y = 3(x+1)^2 - 5$



Write the following function in standard form and identify the conic section:

$$x^2 + 4x - 6y = -10$$

Write the following function in standard form and identify the conic section:

$$3y - 2x^2 = 12x - 9$$

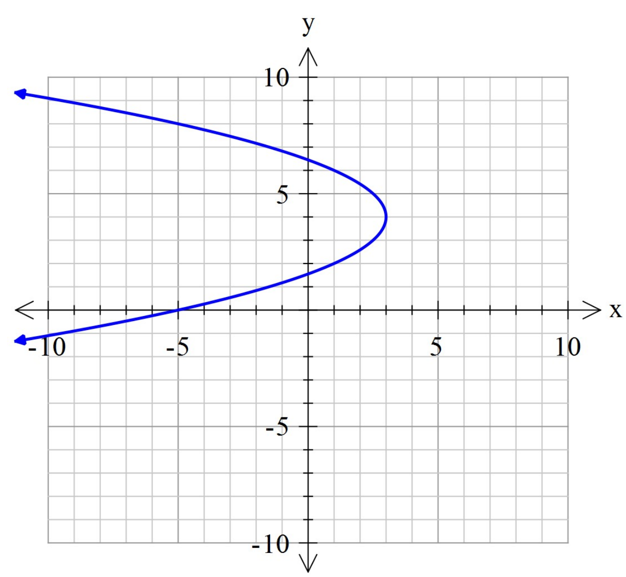
Parabola (horizontal) : One variable is squared (y) and one variable is linear (x).

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

The vertex is (h, k).

Example:

$$x = -\frac{1}{2}(y-4)^2 + 3$$



Write the following function in standard form and identify the conic section:

$$4x + y^2 - 6y = 9$$

Write the following function in standard form and identify the conic section:

$$8y^2 + 32y + 22 = 2x$$

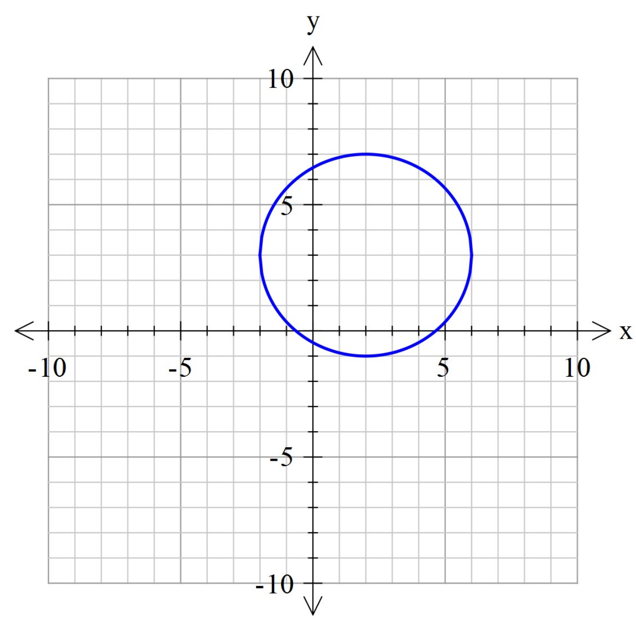
Circles: Both variables are squared with the same coefficient.

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

The center is (h, k). The radius is r.

Example:

$$(x-2)^2+(y-3)^2=16$$



Write the following function in standard form and identify the conic section:

$$x^2 + 4x + y^2 = 5$$

Write the following function in standard form and identify the conic section:

$$x^2 - 6x + y^2 + 2y = 0$$

Ellipse: Both variables are squared and positive but with different coefficients.

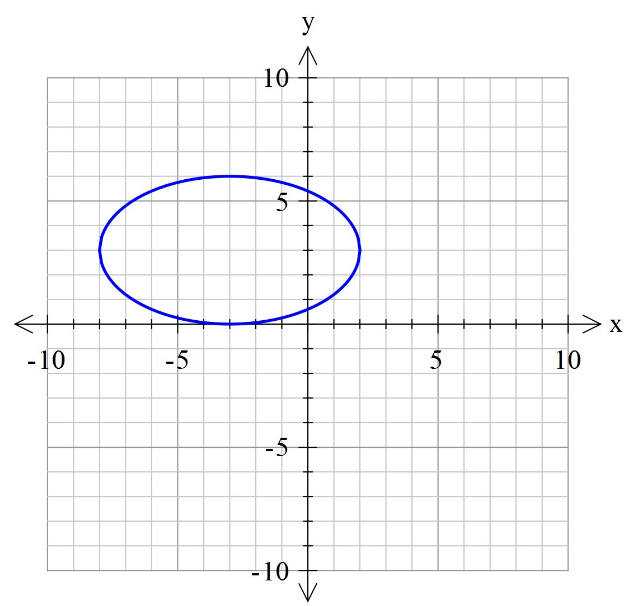
$$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$$

The center is (h, k).

The vertical axis has a length of $2b$ and the horizontal axis has a length of $2a$.

Example:

$$\frac{(x+3)^2}{25}+\frac{(y-3)^2}{9}=1$$



Write the following function in standard form and identify the conic section:

$$8x^2 + 4y^2 - fg8y - 60 = 0$$

Write the following function in standard form and identify the conic section:

$$2x^2 + 3y^2 - 16x + 18y = -11$$

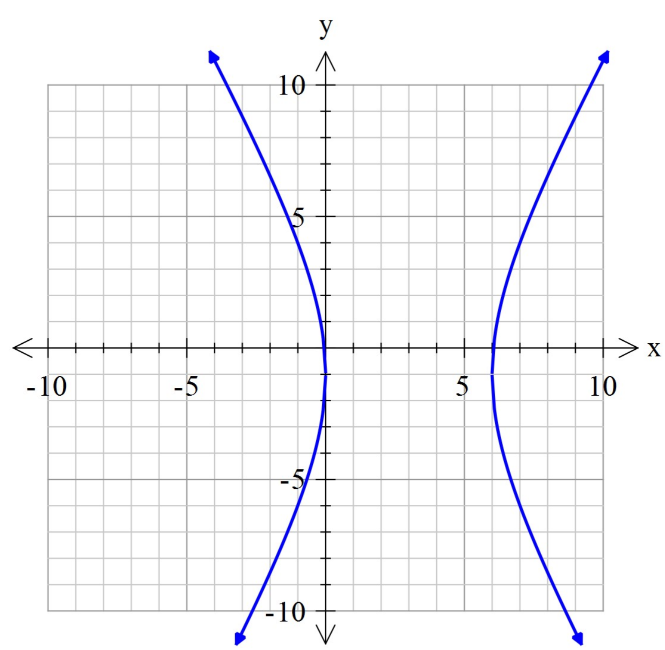
Hyperbola (horizontal): Both variables are squared and have different coefficients. One variable has a negative coefficient (y).

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

The center is (h, k).

Example:

$$\frac{(x-3)^2}{9}-\frac{(y+1)^2}{32}=1$$



Write the following function in standard form and identify the conic section:

$$x^2 - y^2 - 6x - 10y - 20 = 0$$

Write the following function in standard form and identify the conic section:

$$4x^2 - 3y^2 = -12y + 24$$

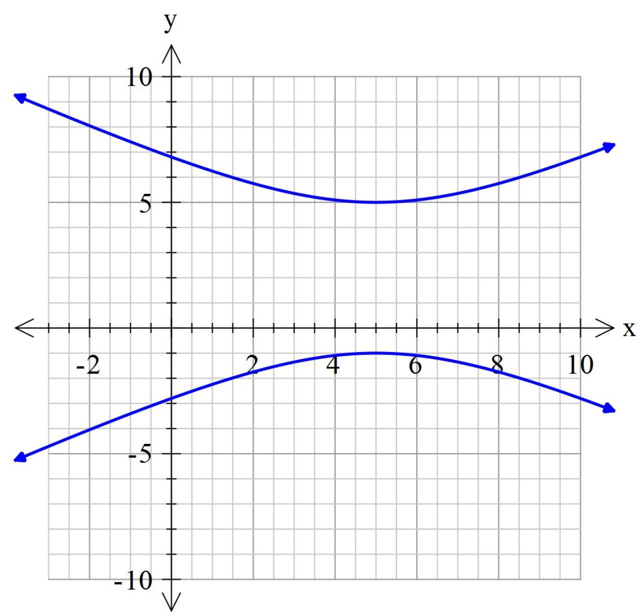
Hyperbola (vertical): Both variables are squared and have different coefficients. One variable has a negative coefficient (x).

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

The center is (h, k).

Example:

$$\frac{(y-2)^2}{9} - \frac{(x-5)^2}{16} = 1$$



Write the following function in standard form and identify the conic section:

$$36y^2 - 4x^2 = 144$$

Write the following function in standard form and identify the conic section:

$$9y^2 - 4x^2 - 16x - 18y - 43 = 0$$