

# Identifying Conic Sections

10.6

## Warm-up

Solve using completing the square

1)  $x^2 - 6x = -8$

2)  $2x^2 - 8x + 3 = 0$

3)  $5x^2 - 50x + 128 = 0$

### Standard Forms for the Conic Sections with Center $(h, k)$

<b>Circle</b>	$(x - h)^2 + (y - k)^2 = r^2$	
	<b>HORIZONTAL AXIS</b>	<b>VERTICAL AXIS</b>
<b>Ellipse</b>	$\frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} = 1$	$\frac{(x - h)^2}{b^2} + \frac{(y - k)^2}{a^2} = 1$
<b>Hyperbola</b>	$\frac{(x - h)^2}{a^2} - \frac{(y - k)^2}{b^2} = 1$	$\frac{(y - k)^2}{a^2} - \frac{(x - h)^2}{b^2} = 1$
<b>Parabola</b>	$x - h = \frac{1}{4p}(y - k)^2$	$y - k = \frac{1}{4p}(x - h)^2$

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Discuss with your partner.

Compare and Contrast the Conic Sections.

What are some things that all the conics sections share?

What is unique about each conic section?

I do.

Identify the Conic Section that each equation represents.

$$6x^2 + 9y^2 + 12x - 15y - 25 = 0$$

### Classifying Conic Sections

For an equation of the form  $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$   
( $A$ ,  $B$ , and  $C$  do not all equal 0.)

CONIC SECTION	COEFFICIENTS
Circle	$B^2 - 4AC < 0$ , $B = 0$ , and $A = C$
Ellipse	$B^2 - 4AC < 0$ and either $B \neq 0$ or $A \neq C$
Hyperbola	$B^2 - 4AC > 0$
Parabola	$B^2 - 4AC = 0$

$$6x^2 + 9y^2 + 12x - 15y - 25 = 0$$

Identify A, B, and C	$A=6, B=0, C=9$
Plug A,B,C into equation	$B^2 - 4AC$ $0^2 - 4(6)(9) = -216$
Identify which Conic Section	Ellipse

We Try:

Identify the Conic Section that each equation represents.

<b>Classifying Conic Sections</b>	
For an equation of the form $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$ (A, B, and C do not all equal 0.)	
CONIC SECTION	COEFFICIENTS
Circle	$B^2 - 4AC < 0, B = 0, \text{ and } A = C$
Ellipse	$B^2 - 4AC < 0$ and either $B \neq 0$ or $A \neq C$
Hyperbola	$B^2 - 4AC > 0$
Parabola	$B^2 - 4AC = 0$

$$4x^2 + 4xy + y^2 - 12x + 8y + 36 = 0$$

Identify A, B, and C	A=    B=    C=
Plug A,B,C into equation	$B^2 - 4AC$
Identify which Conic Section	

You Try in your notebooks:

Identify the Conic Section that each equation represents.

$$6x^2 = 14x + 12y^2 - 16y + 20$$

Identify A, B, and C	A=    B=    C=
Plug A,B,C into equation	$B^2 - 4AC$

Identify which Conic Section	
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I Try:

Find the standard form of the equation by completing the square. Identify each conic.

$$x^2 + 4y^2 + 4x - 24y + 36 = 0$$

Separate the "x" and "y".	$x^2 + 4x + 4y^2 - 24y = -36$
Complete the square for each variable.	$x^2 + 4x + \underline{\quad} + 4y^2 - 24y + \underline{\quad} = -36$ $x^2 + 4x + \underline{\quad} + 4(y^2 - 6y + \underline{\quad}) = -36$ $x^2 + 4x + 4 + 4(y^2 - 6y + 9) = -36 + 4 + 36$
Simplify	$(x + 2)^2 + 4(y - 3)^2 = 4$  $\frac{(x + 2)^2}{4} + \frac{(y - 3)^2}{1} = 1$
Identify	Ellipse.

We: Try

Find the standard form of the equation by completing the square. Identify each conic.

$$x^2 - 12x - 16y + 36 = 0$$

Separate the x and y.	$x^2 - 12x - 16y = -36$
Complete the Square	$x^2 - 12x + 36 - 16y = -36 + 36$
Simplify	$(x - 6)^2 - 16y = 0$ $(x - 6)^2 = 16y$ $\frac{(x - 6)^2}{16} = y$
Identify	Parabola

You Try with your partner:

Even Write, Odd Talk

Find the standard form of the equation by completing the square. Identify each conic

$$-4x^2 + 16y^2 - 16x + 32y - 64 = 0$$

Closure

Discuss with your partner.

What are the steps needed to identify this conic section.

$$25x^2 + 9y^2 + 72y - 81 = 0$$

What are the different types of conic sections and what are the unique properties of each?