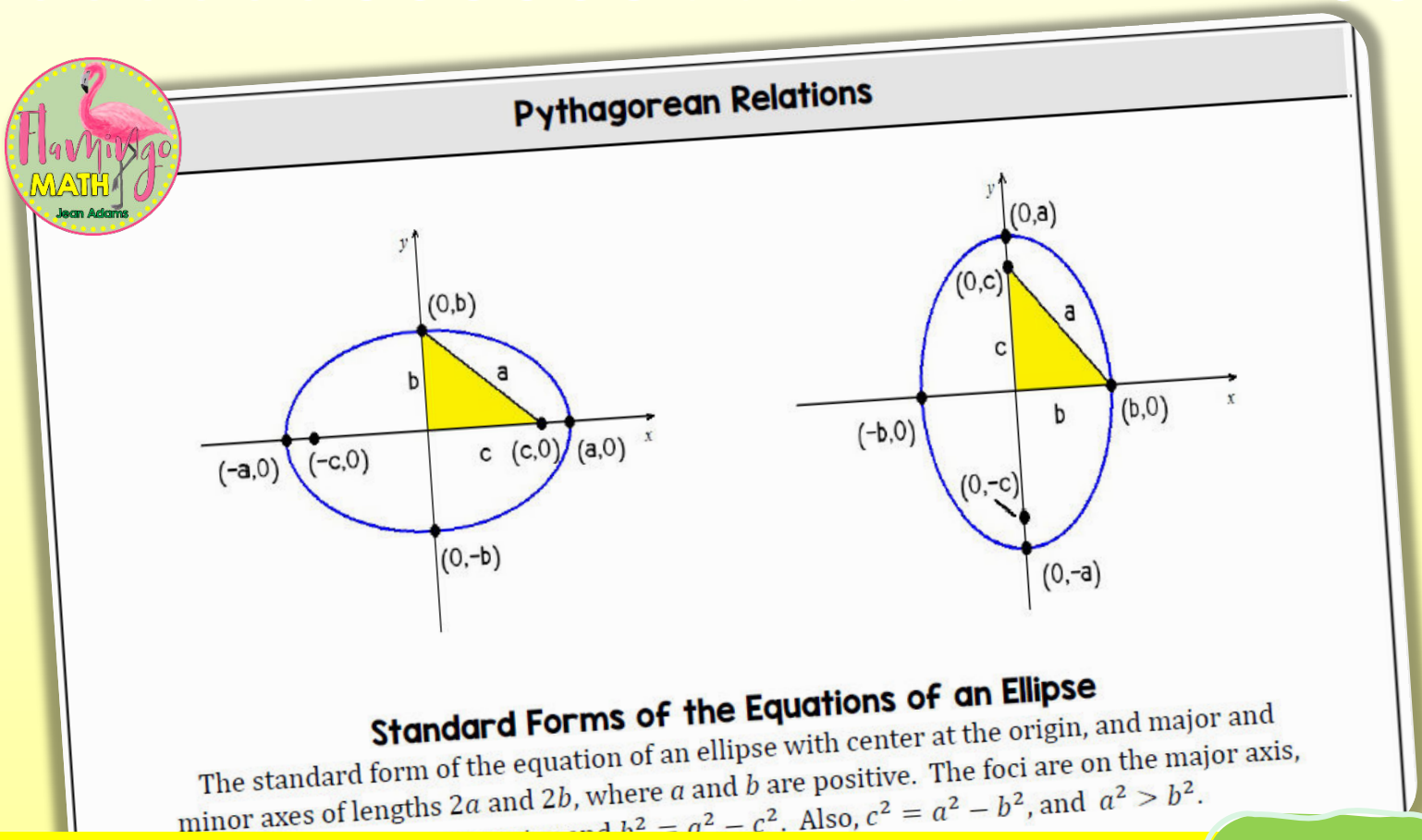
Precalculus Honors

Ellipses



Completely Editable 8.3

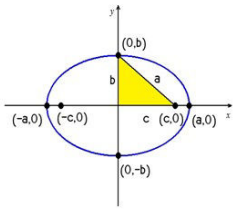
Lesson 8.3: Ellipses

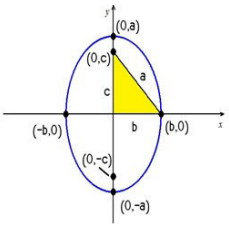
DEFINITION OF AN ELLIPSE

An ellipse is the set of all points (x, y) in a plane whose distance from two fixed points in the plane have a constant sum. The fixed points are the ***foci*** (plural of focus) of the ellipse. The line through the foci is the ***focal axis***. The point on the focal axis midway between the foci is the ***center***. The points where the ellipse intersects its axis are the ***vertices*** of the ellipse.

Verbal Vocabulary	Visual Vocabulary
Exploration: Label the ellipses in the visual vocabulary at the right, using the highlighted words below.	
The ***center*** of an ellipse is the point on the focal axis midway between the foci.	
The foci, plural of focus, are the fixed points ***equidistant*** from the center and located on the ***focal axis*** (major axis).	
The points where the ellipse intersects its axis ar… the ***vertices***.	
A line segment with endpoints on an ellipse are a… called ***chords***.	
We call the chord lying on the focal axis the ***major*** … and the chord through the center perpendicular t… focal axis is the ***minor axis***.	
The major axis length is $2a$, the number a is the ***s*** … ***major axis***.	
The length of the minor axis is $2b$, the number b i… ***semi-minor axis***.	

Pythagorean Relations





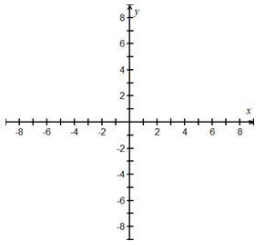
Standard Forms of the Equations of an Ellipse

The standard form of the equation of an ellipse with center at the origin, and major and minor axes of lengths $2a$ and $2b$, where a and b are positive. The foci are on the major axis, c units from the center and $b^2 = a^2 - c^2$. Also, $c^2 = a^2 - b^2$, and $a^2 > b^2$.

Major Axis is Horizontal: $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

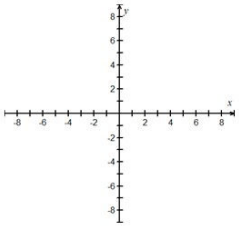
Major Axis is Vertical: $\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$

…hing Basic Ellipses



Finding an Equation of an Ellipse

EX #2: Find the equation in standard form for an ellipse whose foci are (0, 3) and (0, −3) with a major axis length 10.



$a =$ _____ $b =$ _____ $c =$ _____

Major axis _____

Center _____

Major vertices _____

Minor vertices _____

Foci _____

Equation: _____

Graphing an Ellipse Centered at the Origin

EX #3: Graph and locate the foci: $9x^2 + 36y^2 = 324$

$a =$ _____ $b =$ _____ $c =$ _____

Major axis _____

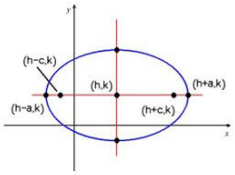
Center _____

Major vertices _____

Minor vertices _____

Foci _____

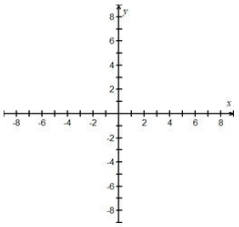
Ellipses with …



Major Axis	Horizon…	
Equation	$\frac{(x-h)^2}{a^2} + \frac{(y-}{}$	
Center		
Focal Axis		
Foci		
Pythagorean Relation		

Finding Vertices and Foci

EX #3: $9(x+3)^2 + 4(y+2)^2 = 36$



$a =$ _____ $b =$ _____ $c =$ _____

Major axis _____

Center _____

Major vertices _____

Minor vertices _____

Foci _____

Equation: _____

Eccentricity

The ***eccentricity of an ellipse*** is $e = \frac{c}{a}$ where a is the semi-major axis, b is the semi-minor axis, and c is the distance from the center of the ellipse to either focus.

EX #4: Prove that the graph of the equation is an ellipse, find its vertices, foci and eccentricity.

$4x^2 + y^2 = 32x + 16y + 124 = 0$

Major vertices _____ Minor vertices _____

Foci _____ Eccentricity _____

NOTES

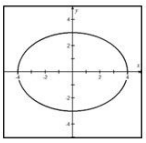
8.3 **Ellipses Homework**

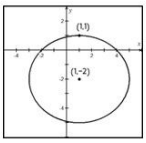
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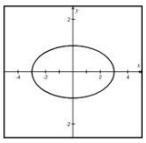
Date _____ Period _____

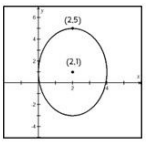
Problems 1 – 6, the graph of an ellipse is given. Match each graph to its equation.

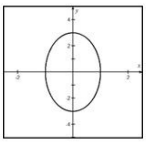
A. $\frac{x^2}{9}+y^2=1$	B. $x^2+\frac{y^2}{9}=1$	C. $\frac{x^2}{16}+\frac{y^2}{9}=1$
D. $\frac{(x+2)^2}{9}+\frac{(y-1)^2}{16}=1$	E. $\frac{(x-2)^2}{4}+\frac{(y-1)^2}{9}=1$	F. $\frac{(x-1)^2}{16}+\frac{(y+2)^2}{9}=1$

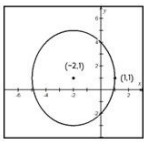
1. 

2. 

3. 

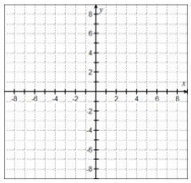
4. 

5. 

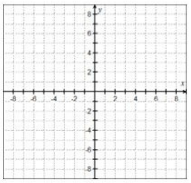
6. 

Problems 7 – 12, find the vertices and foci of each ellipse. Graph each equation.

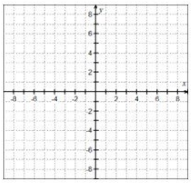
7. $\frac{x^2}{25}+\frac{y^2}{16}=1$



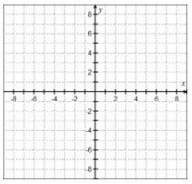
8. $\frac{x^2}{4}+\frac{y^2}{25}=1$



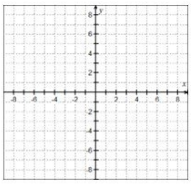
9. $4x^2+9y^2=36$



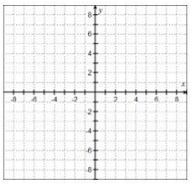
10. Focus at $(4,0)$ vertices at $(\pm 5,0)$



11. Focus at $(0,4)$ vertices at $(0,\pm 6)$

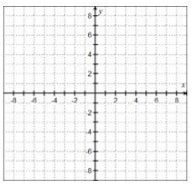


12. $x^2+3y^2=12$

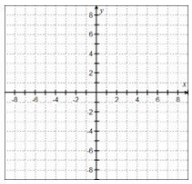


Problems 13 – 16, find the center, foci, and vertices of each ellipse. Graph the equation.

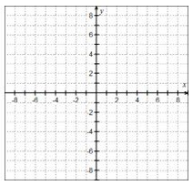
13. $\frac{(x-2)^2}{9}+\frac{(y+3)^2}{16}=1$



14. $\frac{(x+4)^2}{16}+\frac{(y+2)^2}{25}=1$



15. $x^2+4x+4y^2-16y-16=0$



16. $4x^2+25y^2-24x-100y+36=0$

Problems 17-19, solve.

17. Madison is standing at one focus of a whispering gallery and is 6 feet away from the nearest wall. Her friend, Julia is standing at the other focus, 100 feet away. What is the length of the whispering gallery? How high is its elliptical ceiling at the center?

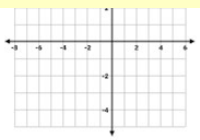
18. A water feature in the shape of an ellipse is built in front of City Hall. The architect plans to place fountains at the foci. If the pool of water is 20 feet long and 12 feet wide, how far from the center should the fountains be located? (Round to the nearest hundredth.)

19. The moon travels around Earth in an elliptical orbit with Earth at one focus. The major axis of

Practice Sets

Lesson Warm-Ups

25 9 $= 1$



3. Complete the squares to find the standard form of the ellipse.

$x^2 + 2y^2 - 2x + 20y + 41 = 0$

Name _____ Date _____ Period _____

Lesson 8.3: Ellipses **Warm-Up # 2**

1. Find the vertices and foci of the ellipse.

$$\frac{(x+2)^2}{25} + \frac{(y+3)^2}{16} = 1$$

2. Sketch the graph.



3. Complete the squares to find the standard form of the ellipse.

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

8.3. Ellipses **Form A**

Name _____

Date _____ Period _____

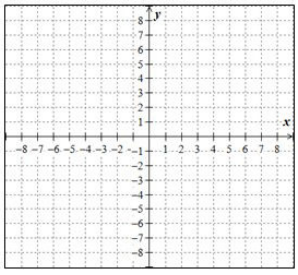
1-2: Find the vertices and foci of the ellipse, and sketch the graph in the grid below.

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

Vertices: _____

Foci: _____

2.



3. Complete the squares to find the standard form of the ellipse.

$x^2 + 2y^2 + 2x - 20y + 42 = 0$

Grade:

8.3. Ellipses **Form B**

Name _____

Date _____ Period _____

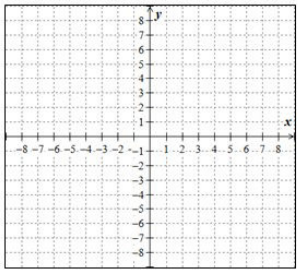
1-2: Find the vertices and foci of the ellipse, and sketch the graph in the grid below.

1. $\frac{(x-3)^2}{25} + \frac{(y+2)^2}{16} = 1$

Vertices: _____

Foci: _____

2.



3. Complete the squares to find the standard form of the ellipse.

$x^2 + 2y^2 + 4x - 12y + 6 = 0$

Grade:

Daily Lesson Quiz