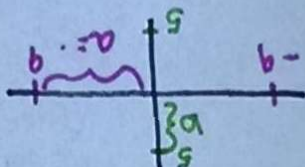
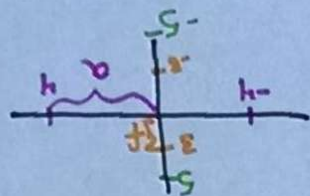
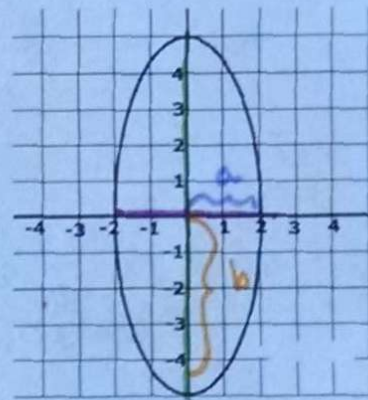
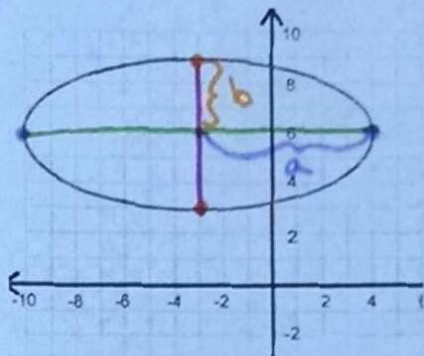


# ELLIPSES



<p>Write the equation of an Ellipse, centered at (0,0), given the following information...</p> $1 = \frac{x^2}{25} + \frac{y^2}{9} = 1$ <p><math>b^2 = 25</math> <math>b = 5</math></p> <p><math>a^2 = 9</math> <math>a = 3</math></p> <p><math>c^2 = b^2 - a^2</math> <math>c^2 = 25 - 9 = 16</math> <math>c = 4</math></p> <p>Co-Vertex (4,0) and Focus (0,3)</p>	$1 = \frac{x^2}{25} + \frac{y^2}{16} = 1$ <p><math>b^2 = 25</math> <math>b = 5</math></p> <p><math>a^2 = 16</math> <math>a = 4</math></p> <p><math>c^2 = b^2 - a^2</math> <math>c^2 = 25 - 16 = 9</math> <math>c = 3</math></p> <p>Vertex (9,0) and Co-Vertex (0,5)</p>
$1 = \frac{x^2}{100} + \frac{y^2}{36} = 1$ <p><math>b^2 = 100</math> <math>b = 10</math></p> <p><math>a^2 = 36</math> <math>a = 6</math></p> <p><math>c^2 = b^2 - a^2</math> <math>c^2 = 100 - 36 = 64</math> <math>c = 8</math></p> <p>Vertex (-10,0) and Focus (8,0)</p>	$1 = \frac{x^2}{25} + \frac{y^2}{9} = 1$ <p><math>b^2 = 25</math> <math>b = 5</math></p> <p><math>a^2 = 9</math> <math>a = 3</math></p> <p><math>c^2 = b^2 - a^2</math> <math>c^2 = 25 - 9 = 16</math> <math>c = 4</math></p> <p>Co-Vertex (-4,0) and Focus (0,3)</p>



**Vertices**: the points at which an ellipse makes its sharpest turn and lies on the major axis, at the end

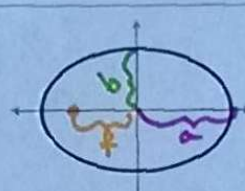
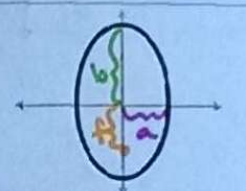
**Co-vertices**: end of minor axis

**Focus/Foci**: fixed points that define the ellipse and lies on the major axis

**Major axis**: the longest diameter of the ellipse


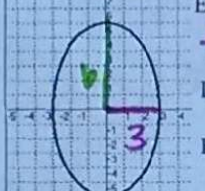
**Minor axis**: the shortest diameter of the ellipse

### Standard Form of an Equation of an Ellipse with Center at (0, 0)

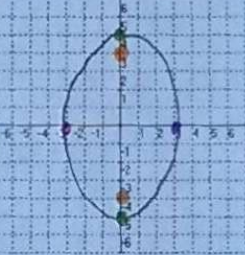
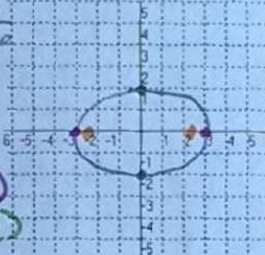
Major Axis	Horizontal $a > b$	Vertical $b > a$
Equation	$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$	$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
Vertices	$(a, 0)$ and $(-a, 0)$	$(0, b)$ and $(0, -b)$
Foci	$(f, 0)$ and $(-f, 0)$	$(0, f)$ and $(0, -f)$
Co-Vertices	$(0, b)$ and $(0, -b)$	$(a, 0)$ and $(-a, 0)$
Graph		

The values of  $a$ ,  $b$ , and  $f$  are related by the equation  $f^2 = a^2 - b^2$ .  
 The length of the major axis is \_\_\_\_\_ and length of the minor axis is \_\_\_\_\_.

Write the Equation in Standard Form with center (0, 0) and find the domain and range

	Equation: $\frac{x^2}{25} + \frac{y^2}{16} = 1$ Domain: $[-5, 5]$ Range: $[-4, 4]$		Equation: $\frac{x^2}{9} + \frac{y^2}{36} = 1$ Domain: $[-3, 3]$ Range: $[-6, 6]$ $-6 \leq y \leq 6$
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Graph each Ellipse. Find the Foci as well ☺

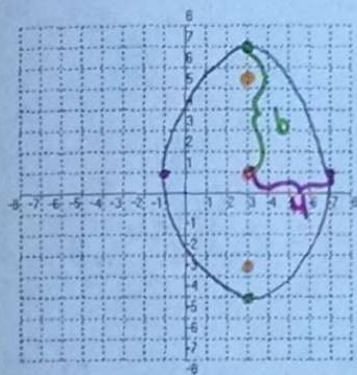
a. $\frac{x^2}{9} + \frac{y^2}{25} = 1$ $a=3$ $b=5$ Vertices: $(0, 5)$ and $(0, -5)$ Co-Vertices: $(3, 0)$ and $(-3, 0)$ Foci: $f^2 = b^2 - a^2$ $5^2 - 3^2$ $25 - 9$ $f^2 = 16$ $f = 4$ $(0, 4)$ and $(0, -4)$		b. $\frac{4x^2}{36} + \frac{9y^2}{36} = \frac{36}{36}$ $\frac{x^2}{9} + \frac{y^2}{4} = 1$ $a=3$ $b=2$ Vertices: $(3, 0)$ and $(-3, 0)$ Co-Vertices: $(0, 2)$ and $(0, -2)$ Foci: $f^2 = a^2 - b^2$ $3^2 - 2^2$ $9 - 4$ $f^2 = 5$ $f = \sqrt{5} \approx 2.2$ $(\pm 2.2, 0)$	
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### Standard Form of an Equation of an Ellipse with Center at (h, k)

Major Axis	Horizontal $a > b$	Vertical $a < b$
Equation	$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$	$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$
Vertices	$(h+a, k)$ and $(h-a, k)$	$(h, k+b)$ and $(h, k-b)$
Foci	$(h+f, k)$ and $(h-f, k)$	$(h, k+f)$ and $(h, k-f)$
Co-Vertices	$(h, k+b)$ and $(h, k-b)$	$(h+a, k)$ and $(h-a, k)$

Graph each Ellipse

a. $\frac{(x-3)^2}{16} + \frac{(y-1)^2}{36} = 1$ center $(3, 1)$ $a=4$ $b=6$	b. $\frac{(x+2)^2}{25} + \frac{(y-4)^2}{9} = 1$ center $(-2, 4)$ $a=5$ $b=3$
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Vertices:  $(3, 7)$  and  $(3, -5)$

Co-Vertices:  $(-1, 1)$  and  $(7, 1)$

Foci:  $(3, 5.5)$  and  $(3, -3.5)$

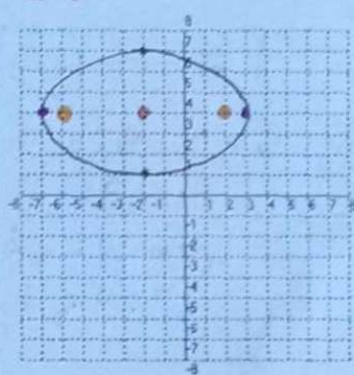
$$f^2 = b^2 - a^2$$

$$6^2 - 4^2$$

$$36 - 16$$

$$f^2 = 20$$

$$f = \sqrt{20} \approx 4.5$$



Vertices:  $(-7, 4)$  and  $(3, 4)$

Co-Vertices:  $(-2, 1)$  and  $(-2, 7)$

Foci:  $(2, 4)$  and  $(-6, 4)$

$$f^2 = a^2 - b^2$$

$$25 - 9$$

$$\sqrt{f^2} = \sqrt{16}$$

$$f = \pm 4$$