Precalc 10.3

Determine and use standard and general forms for the equations of ellipses
Graph ellipses
Locate and use foci on ellipses

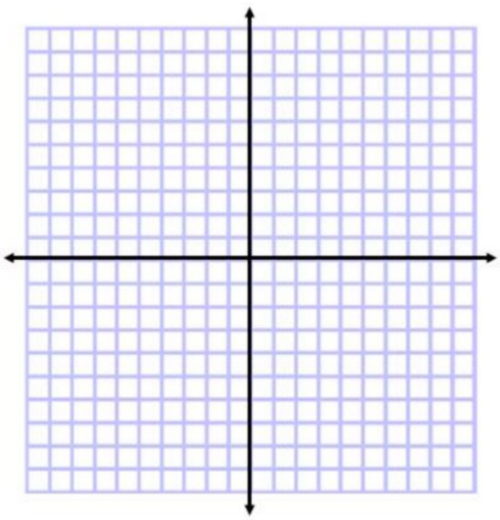
Quiz 10.1-10.2

major axis

minor axis

eccentricity

3 For the equation $\frac{(y-3)^2}{25} + \frac{(x+4)^2}{9} = 1$, find the coordinates of the center, foci, and vertices of the ellipse. Then graph the equation.



4 Find the coordinates of the center, the foci, and the vertices of the ellipse with the equation $4x^2 + 9y^2 - 40x + 36y + 100 = 0$. Then graph the equation.

$$\frac{(x-5)^2}{9} + \frac{(y+2)^2}{4} = 1$$

$a^2 = 9$ $\quad b^2 = 4$

$(4x^2 - 40x \quad) + (9y^2 + 36y$

$4(x^2 - 10x + 25) + 9(y^2 + 4y +$

$$\frac{4(x-5)^2}{36} + \frac{9(y+2)^2}{36} = \frac{36}{36}$$

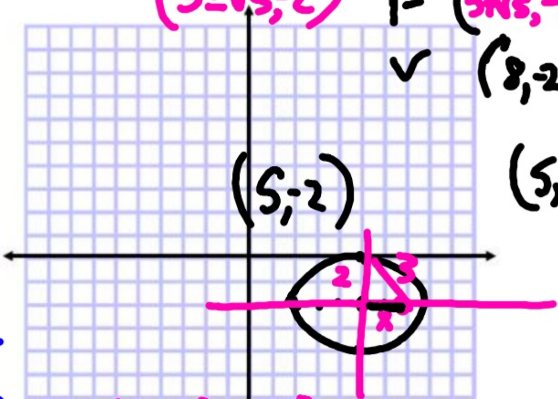
C $(5, -2)$

$(5 \pm \sqrt{5}, -2)$

F $(5+\sqrt{5}, -2)$ $(5-\sqrt{5}, -2)$

V $(8, -2)$ $(2, -2)$

$(5, 0)$ $(5, 4)$



$x^2 + 2^2 = 3^2$

$x^2 + 4 = 9$

$x = \pm\sqrt{5}$

The eccentricity of an ellipse, denoted by e, is a measure that describes the shape of an ellipse. It is defined as $e = \frac{c}{a}$. Since $0 < c < a$, you can divide by a to show that $0 < e < 1$.

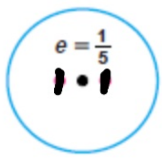
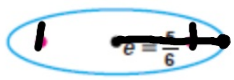
$0 < e < 1$ $\quad e = \frac{c}{a}$

$0 < c < a$

$0 < \frac{c}{a} < 1$ *Divide by a.*

$0 < e < 1$ *Replace $\frac{c}{a}$ with e.*

The table shows the relationship between the value of e, the location of the foci, and the shape of the ellipse.

Value of *e*	**Location of Foci**	**Graph**
close to 0	near center of ellipse	
close to 1	far from center of ellipse	

focus

e=c/a

37. The center is the origin, $\frac{1}{2} = \frac{c}{a}$, and the length of the horizontal semi-major axis is 10 units.

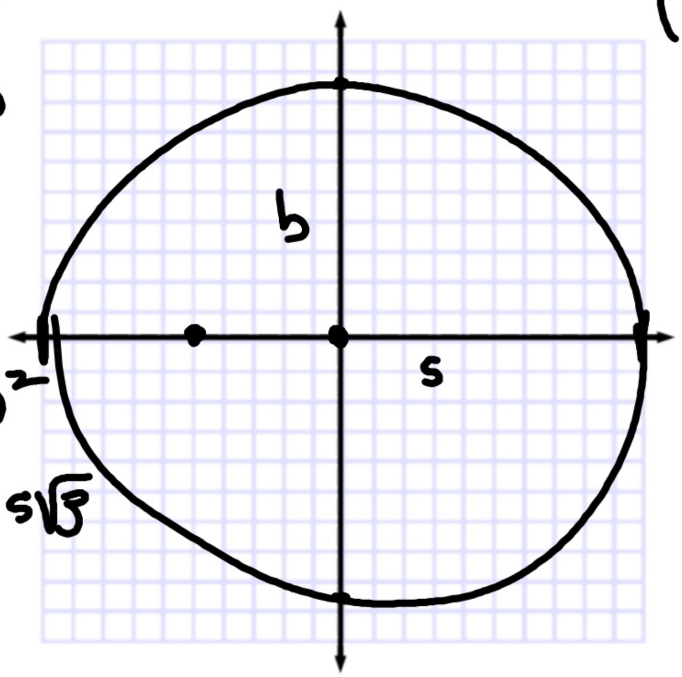
semi-major $\frac{x^2}{} + \frac{y^2}{}$

$$\frac{(x-0)^2}{100} + \frac{(y-0)^2}{75} = 1$$

$\frac{1}{2} = \frac{c}{10}$

$2c = 10$

$c = 5$



$b^2 + 5^2 = 10^2$

$b^2 = 75$

$b = \pm 5\sqrt{3}$

$a^2 + c^2 = b^2$

39. The ellipse has its center at the origin, $a = 2$, and $e = \frac{3}{4}$.

$4 + 2.25 = b^2$

$b = 2.5$

e=c/a

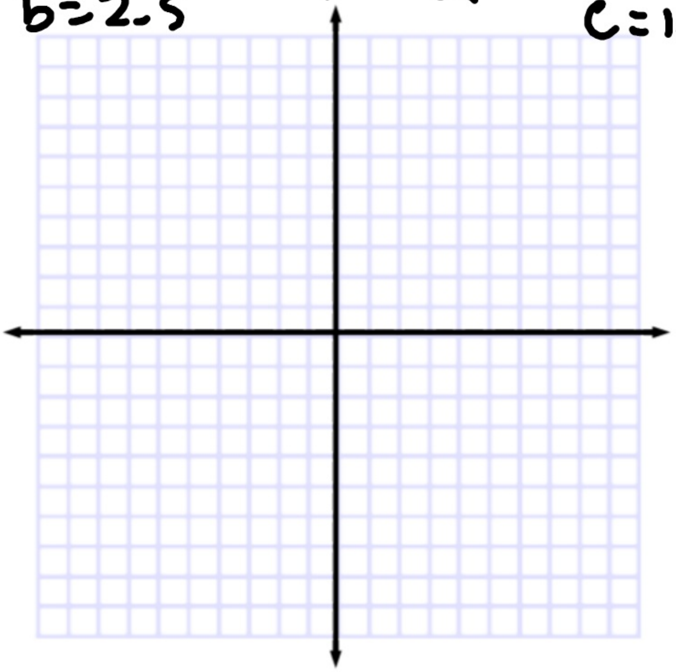
$\frac{3}{4} = \frac{c}{2}$

$4c = 6$

$c = 1.5$

$\frac{x^2}{4} + \frac{y^2}{6.25} = 1$

$\frac{x^2}{6.25} + \frac{y^2}{4} = 1$



40. The foci are at (3, 5) and (1, 5), and the ellipse has eccentricity 0.25.

e=c/a

$a=4$

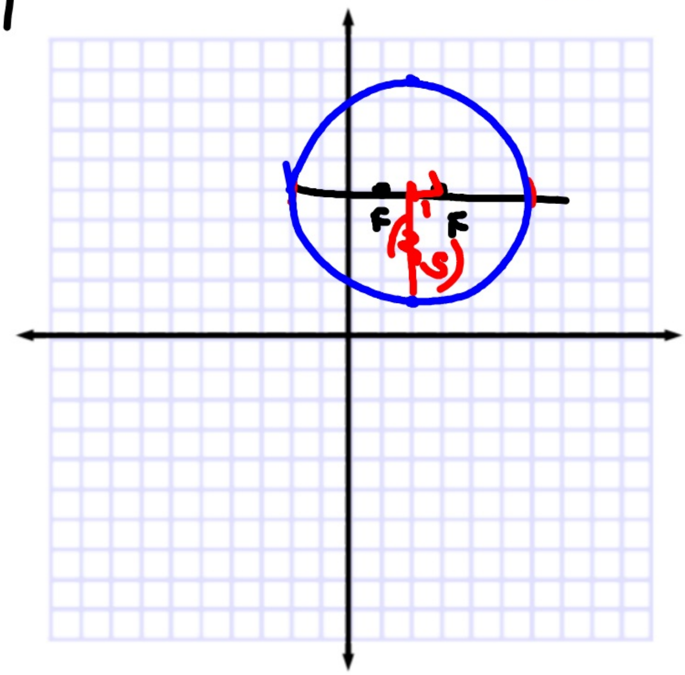
$\frac{1}{4}=\frac{1}{a}$

$$\frac{(x-2)^2}{16}+\frac{(y-5)^2}{15}=1$$

$$1^2+x^2=y^2$$

$$x^2=15$$

$$x=\pm\sqrt{15}$$



10.3
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