Spiral Review:

Simplify.

1. $\sqrt{56}$

$2\sqrt{14}$

2. $\sqrt{12} \bullet \sqrt{20}$

$4\sqrt{15}$

3. $\sqrt{\frac{9}{4}}$

$\frac{3}{2}$

4. $\frac{1}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}}$

$\frac{\sqrt{7}}{7}$

5. $\sqrt{\frac{5}{2}} = \frac{\sqrt{5}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$\frac{\sqrt{10}}{2}$

6. $\frac{\frac{\sqrt{2}}{2}}{\frac{\sqrt{3}}{2}} = \frac{\sqrt{2}}{\cancel{2}} \cdot \frac{\cancel{2}}{\sqrt{3}}$

$\frac{\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{6}}{3}$

p.647 9.2 Ellipses (Day 2)

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

*horizontal (major axis)

eccentricity: $e = \frac{c}{a}$

foci: (h±c, k)

vertices: (h±a, k)

$$**\, c = \sqrt{a^2 - b^2}\, **$$

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

*vertical (major axis)

eccentricity: $e = \frac{c}{a}$

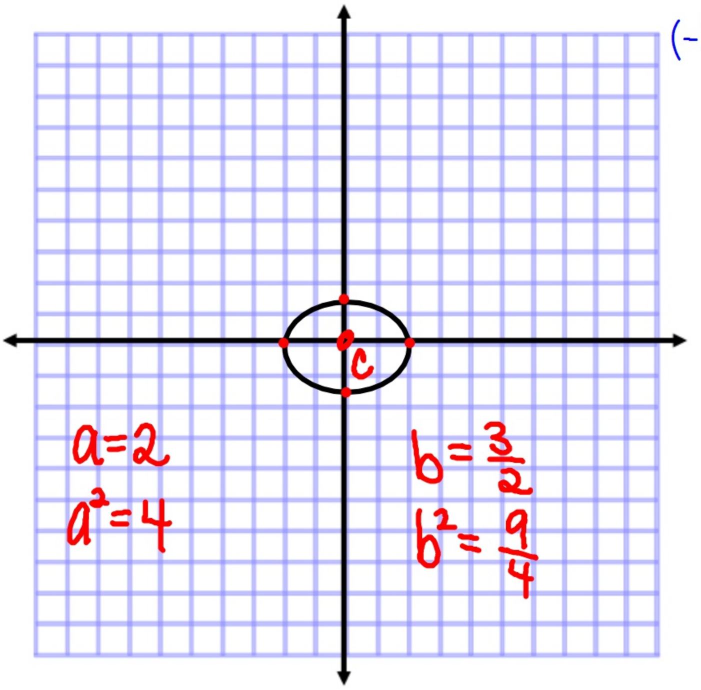
foci: (h, k±c)

vertices: (h, k±a)

Students will be able to find the standard form of the equation of the ellipse.

Example 1: Find the standard form of the equation of the ellipse with the given characteristics and center at the origin.

a.)



$a=2$

$a^2=4$

$b=\frac{3}{2}$

$b^2=\frac{9}{4}$

(-2,0) (0, 3/2) (2,0) (0,-3/2)

horizontal

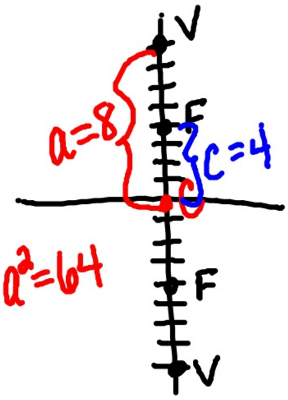
$$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$$

$$\frac{(x-0)^2}{4}+\frac{(y-0)^2}{\frac{9}{4}}=1$$

$$\boxed{\frac{x^2}{4}+\frac{y^2}{\frac{9}{4}}=1}$$

Students will be able to find the standard form of the equation of the ellipse.

b.) vertices: (0,±8) foci: (0,±4)



$a=8$

$c=4$

$a^2=64$

vertical

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

$$\boxed{\frac{(x-0)^2}{48}+\frac{(y-0)^2}{64}=1}$$

or

$$\boxed{\frac{x^2}{48}+\frac{y^2}{64}=1}$$

$$c=\sqrt{a^2-b^2}$$

$$(4)^2=\left(\sqrt{64-b^2}\right)^2$$

$$16=64-b^2$$

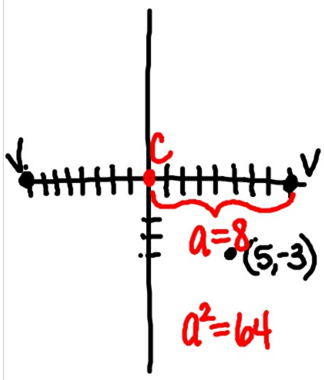
$$\underline{-64\quad -64}$$

$$\frac{-48}{-1}=\frac{-b^2}{-1}$$

$$48=b^2$$

Students will be able to find the standard form of the equation of the ellipse.

c.) vertices: (±8,0) passes through $(\overset{x}{5}, \overset{y}{-3})$



$$\boxed{\frac{x^2}{64}+\frac{y^2}{\frac{192}{13}}=1}$$

horizontal

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

$$\frac{(x-0)^2}{64}+\frac{(y-0)^2}{b^2}=1$$

$$\frac{(5-0)^2}{64}+\frac{(-3-0)^2}{b^2}=1$$

$$\frac{25}{64}+\frac{9}{b^2}=1$$

$$-\frac{25}{64} \qquad -\frac{25}{64}$$

$$\frac{9}{b^2}=\frac{39}{64}$$

$$\frac{39b^2}{39}=\frac{576}{39}$$

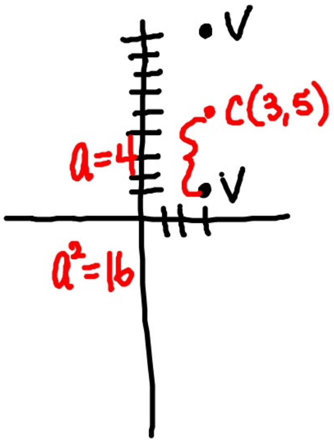
$$b^2=\frac{192}{13}$$

Students will be able to find the standard form of the equation of the ellipse.

Example 2: Find the standard form of the equation of the ellipse with the given characteristics.

$b=3 \quad b^2=9$

a.) vertices: (3,1) (3,9); minor axis of length 6



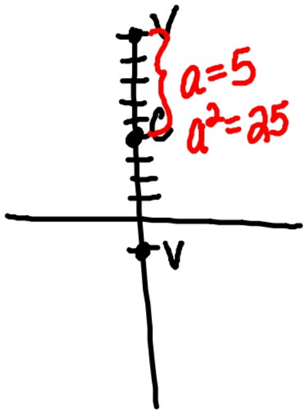
vertical

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

$$\boxed{\frac{(x-3)^2}{9}+\frac{(y-5)^2}{16}=1}$$

Students will be able to find the standard form of the equation of the ellipse.

b.) Center: (0,4); a = 5c; vertices: (0,-1) (0,9)



vertical

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

$$\frac{(x-0)^2}{24}+\frac{(y-4)^2}{25}=1$$

or

$$\boxed{\frac{x^2}{24}+\frac{(y-4)^2}{25}=1}$$

$a=5c$

$5=5c$

$c=1$

$c=\sqrt{a^2-b^2}$

$(1)^2=\left(\sqrt{25-b^2}\right)^2$

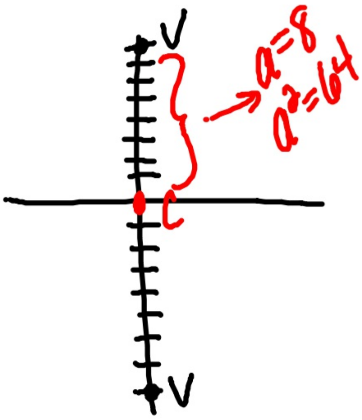
$1=25-b^2$

$-24=-b^2$

$b^2=24$

Students will be able to find the standard form of the equation of the ellipse.

c.) vertices: (0,±8); eccentricity: 1/2 → $e=\frac{c}{a}$



vertical

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

$$\frac{(x-0)^2}{48}+\frac{(y-0)^2}{64}=1$$

or

$$\boxed{\frac{x^2}{48}+\frac{y^2}{64}=1}$$

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

$\cancel{\frac{1}{2}=\frac{c}{8}}$

$2c=8$

$c=4$

$(4)^2=\left(\sqrt{64-b^2}\right)^2$

$16=64-b^2$

$b^2=48$

Students will be able to solve applied problems using ellipses.

Example 3: Halley's comet has an elliptical orbit with the sun at one focus. The eccentricity of the orbit is approximately 0.97. The length of the major axis of the orbit is about 35.67 astromical units. (An astromical unit is about 93 million miles) Find the standard form of the equation of the orbit. Place the center of the orbit at the origin and place the major axis on the x-axis. p.654 (#53)

$e = .97$

$\frac{c}{a} = .97$

$\frac{c}{17.835} = .97$

$c = 17.299$

major axis $= 35.67$

$a = \frac{35.67}{2} = 17.835$

$a^2 = 318.087$

$c = \sqrt{a^2 - b^2}$

$17.299 = \sqrt{318.087 - b^2}$

$b^2 = 18.832$

center: $(0,0)$ → h, k

major axis: x-axis

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

$$\boxed{\frac{(x-0)^2}{318.097} + \frac{(y-0)^2}{18.832} = 1}$$

Turn-in: p.653 (18, 26, 50)

HW: p.653 (13-27,49,51,54,55)