

9-2 day 2

Find the standard form of the ellipse.

Ex 1) major axes: (2, 6) and (2, 0) and minor axes: (1, 3) and (3, 3)

$2a = 6$
 $a = 3 \Rightarrow a^2 = 9$
 center: (2, 3)

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

$2b = 2$
 $b = 1$
 $b^2 = 1$

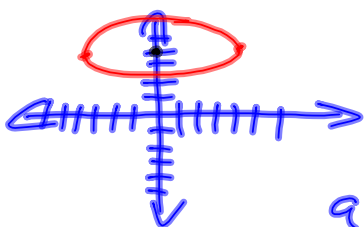
Ex 2) foci: (0, 0) and (0, 8) and major axes length = 16.

$c = 4$ $2a = 16$
 $a = 8 \Rightarrow a^2 = 64$
 center: (0, 4)

$$\frac{(x-0)^2}{48} + \frac{(y-4)^2}{64} = 1$$

$c^2 = a^2 - b^2$
 $4^2 = 64 - b^2$
 $16 = 64 - b^2$
 $-48 = -b^2 \Rightarrow b^2 = 48$

Ex 3) center: (0, 4), $a = 2c$, vertices: (-4, 4) and (4, 4)



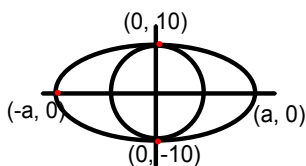
$$\begin{aligned} 2a &= 8 \\ a &= 4 \\ a^2 &= 16 \end{aligned}$$

$$\begin{aligned} a &= 2c \\ 4 &= 2c \\ 2 &= c \end{aligned}$$

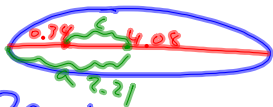
$$\frac{x^2}{16} + \frac{(y-4)^2}{12} = 1$$

$$\begin{aligned} c^2 &= a^2 - b^2 \\ 2^2 &= 16 - b^2 \\ -12 &= -b^2 \\ 12 &= b^2 \end{aligned}$$

Ex 4) The area of the ellipse in the figure is twice the area of the circle. What is the length of the major axis? (Hint: Area of an ellipse is given by $A = \pi ab$.)



Ex 5) **Astronomy:** The comet Encke has an elliptical orbit with the sun at one focus. Encke's orbit ranges from .34 to 4.08 astronomical units from the sun. 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.



$$2a = 4.08 + 0.34$$

$$2a = 4.42$$

$$a = 2.21$$

$$a^2 = 4.88$$

$$c = 2.21 - 0.34$$

$$c = 1.87$$

$$c^2 = 3.49$$

$$\frac{x^2}{4.88} + \frac{y^2}{1.38} = 1$$

$$c^2 = a^2 - b^2$$

$$3.5 = 4.88 - b^2$$

$$-1.38 = -b^2$$

$$1.38 = b^2$$