

Day 43

10.4 Ellipses with center (0,0)

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

bigger #

major axis: X

vertices: $(\pm a, 0)$

co-vertices: $(0, \pm b)$

Foci: $(\pm c, 0)$

* Foci always lie on the major axis!

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

ex1

$$\frac{x^2}{16} + \frac{y^2}{9} = 1$$

bigger

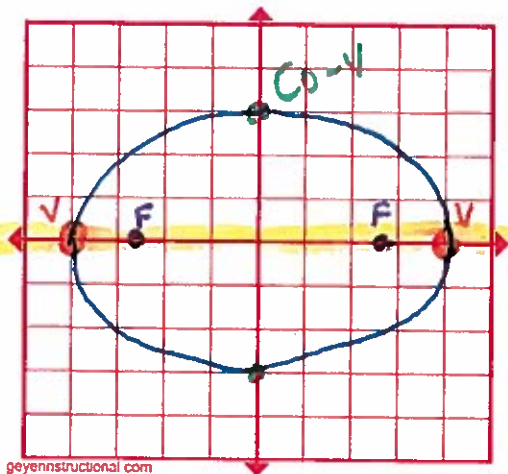
$$a^2 = 16$$
$$a = 4$$

$$b^2 = 9$$
$$b = 3$$

$$c^2 = 16 - 9$$

$$\sqrt{c^2} = \sqrt{7}$$

$$c = \sqrt{7} \text{ or } 2.6$$



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major axis: X

vertices: $(\pm 4, 0)$

Foci: $(\pm 2.6, 0)$

co-vertices: $(0, \pm 3)$

$$\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$$

↑ bigger

major axis: y

vertices $(0, \pm a)$

Foci: $(0, \pm c)$

co-vertices: $(\pm b, 0)$

ex 2

$$\frac{x^2}{4} + \frac{y^2}{49} = 1$$

$b^2 = 4$
 $b = 2$

$a^2 = 49$
 $a = 7$

$$\sqrt{45}$$

$$\sqrt{9 \cdot 5} = 3\sqrt{5}$$

major axis: y

vertices $(0, \pm 7)$

co-vertices $(\pm 2, 0)$

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

$$c^2 = 49 - 4$$

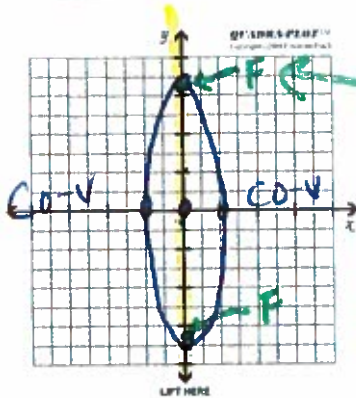
$$\sqrt{c^2} = \sqrt{45}$$

$$c \approx 6.7$$

Foci $(0, \pm 3\sqrt{5})$

OR

$(0, \pm 6.7)$

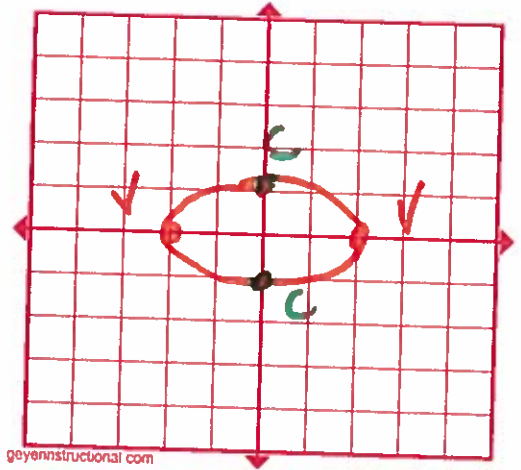


Write the eq. of the ellipse given the vertex and a co-vertex.

- ① $(0, 1)$ $(2, 0)$
 b a
 Co-vertex vertex
 major axis: x

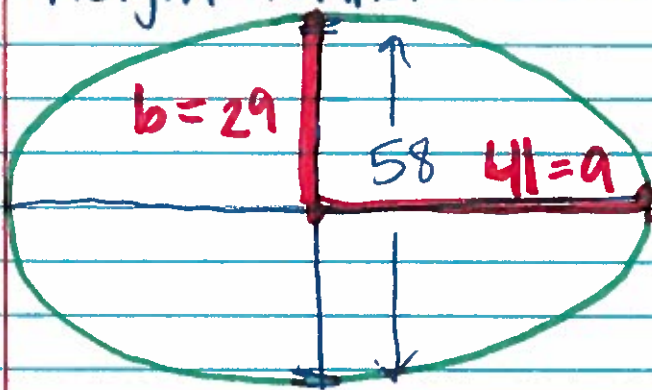
$$\frac{x^2}{4} + \frac{y^2}{1} = 1$$

a^2 b^2



- ② $(0, -7)$ $(4, 0)$
 x y x y
 Square $\frac{x^2}{16} + \frac{y^2}{49} = 1$
 Square

- ③ ex width tunnel 82 ft
 height tunnel 58 ft



$$\frac{x^2}{1681} + \frac{y^2}{841} = 1$$

← 82 →

major axis ~~X~~

ex

Write the equation foci $(\pm 6, 0)$
+ covertices $(0, \pm 8)$.

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

$$6^2 = a^2 - 8^2$$

$$\begin{array}{r} 36 = a^2 - 64 \\ +64 \quad +64 \end{array}$$

$$\boxed{100 = a^2}$$

major X

$$\boxed{\frac{x^2}{100} + \frac{y^2}{64} = 1}$$

ex

Find the foci

$$\frac{36x^2}{288} + \frac{8y^2}{288} = \frac{288}{288}$$

make equal to 1
by \div by 288

Find c.

$$c^2 = 36 - 8$$

$$\sqrt{c^2} = \sqrt{28}$$

$$c = 2\sqrt{7}$$

$$\boxed{\frac{x^2}{8} + \frac{y^2}{36} = 1}$$

b^2 a^2 major y

$$\boxed{\text{foci } (0, \pm 2\sqrt{7})}$$

20-26 Even: Graphs

p. 571-572 (2-14 even, 20-38 even)
44 + 46