

Algebra 2

## 4.5 Ellipses (Day 2)

## Working Backwards

(Problems starting with info &amp; asking for the equation of the ellipse)

I suggest that you sketch/graph what you know.

Remember that the center of the ellipse is the midpoint between the endpoints of the major axis, the minor axis, and the foci.

**Ex. 1:** The major axis is 12 units in length and is parallel to the x-axis.

The minor axis is 8 units in length.

The center is located at  $(-3, 2)$ .

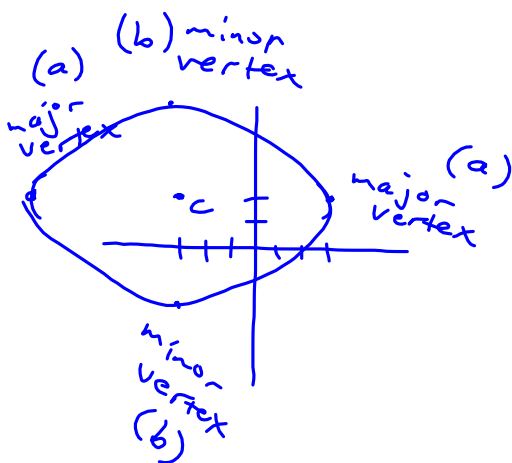
$$2a = 12$$

$$a = 6$$

left & right  
of center  
stretched  
horizontally

$$2b = 8$$

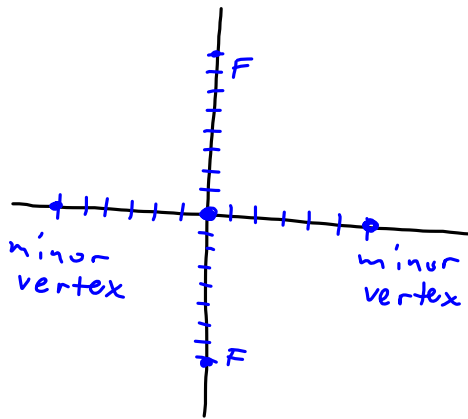
$$b = 4 \rightarrow 4 \text{ up \& } 4 \text{ down}$$



$$\frac{(x + 3)^2}{36} + \frac{(y - 2)^2}{16} = 1$$

$\uparrow$   $a^2 = 6^2$        $\uparrow$   $b^2 = 4^2$

Ex. 2: The endpoints of the minor axis are (-6, 0) and (6, 0).  
 The foci are at (0, -8) and (0, 8).



midpoint is (0,0)

midpoint of these is (0,0)

$c = 8$ , the distance from (0,0) to either point

$b = 6$ , the distance b/w (0,0) & either point

These are minor vertices, so the stretch has to be the other direction, vertical.

↳ so  $y$  is over the bigger denominator.

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

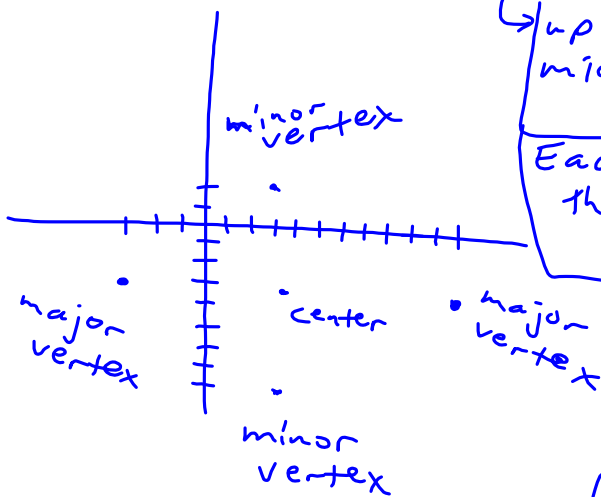
$$a^2 - 6^2 = 8^2$$

$$a^2 - 36 = 64$$

$$a^2 = 100$$

$$\frac{(x-0)^2}{36} + \frac{(y-0)^2}{100} = 1$$

Ex. 3: The major vertices are at (11, -3) and (-3, -3).  
 The minor vertices are at (4, 2) and (4, -8).



↳ up & down. midpoint is (4, -3) center

↳ left & right of some point so horizontal

Each is 5 from the center, so  $b = 5$

$x$  is over the bigger denominator.

Each is 7 from the center so  $a = 7$

$$\frac{(x-4)^2}{49} + \frac{(y+3)^2}{25} = 1$$

$\uparrow$                        $\uparrow$   
 $a^2 = 7^2$                $b^2 = 5^2$