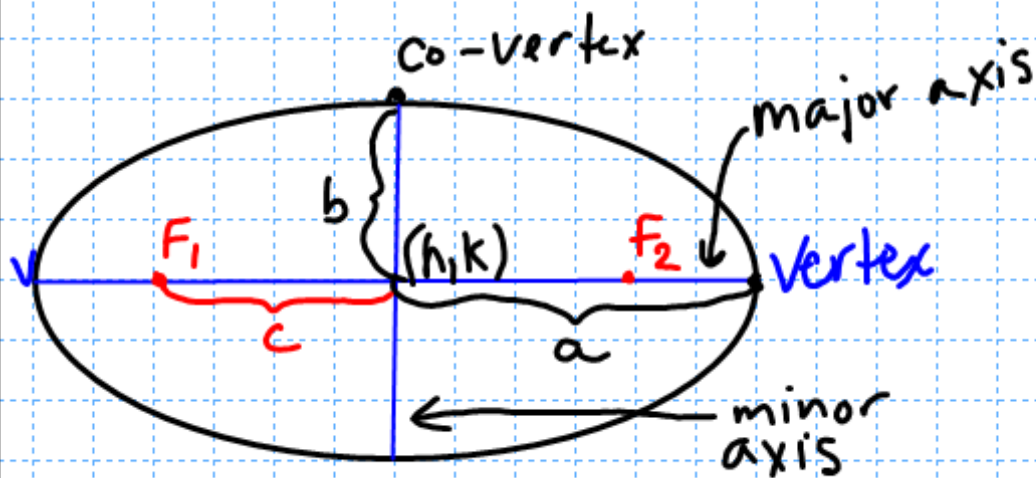


## 10.2 Ellipses

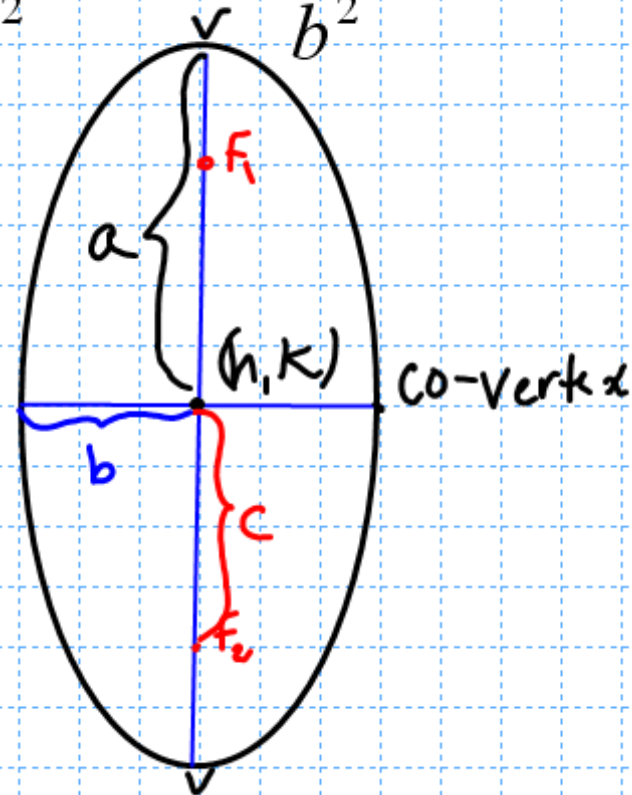
**Ellipse:** The set of all points  $(x,y)$  in a plane, the sum of whose distances from two distinct fixed points (**foci**) is constant.

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

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



$(h, k)$  is the center



- $2a$  is the length of the major axis
- $2b$  is the length of the minor axis
- the vertices and the foci are on the major axis
- $(h, k)$  is the center
- each focus is  $c$  units from the center, with  $c^2 = a^2 - b^2$ ,  $a > b$

Example: Find the center, vertices and foci of the ellipse given by

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

$\uparrow$        $\uparrow$   
 $a^2$      $b^2$

Center:  $(0,0)$

$$a^2 = 16, a = \pm 4$$

$$b^2 = 9, b = \pm 3$$

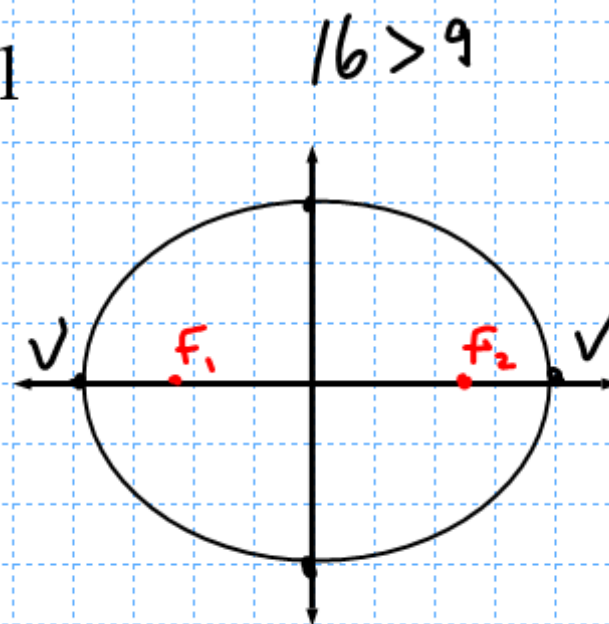
Vertices:  $(-4,0)$   $(4,0)$

Foci: use  $c^2 = a^2 - b^2$

$$c^2 = 16 - 9$$

$$c^2 = 7$$

$$c = \pm\sqrt{7}, \pm 2.6$$



Foci:  $(\sqrt{7}, 0)$   $(-\sqrt{7}, 0)$

Example: Find the center, vertices and foci of the ellipse given by  $\frac{(x-2)^2}{8} + \frac{(y+3)^2}{25} = 1$

