

Ellipses (Section H-2)

* standard form for an ellipse:

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

a^2 must be the larger # than b^2 .
must be ADDING $x^2 + y^2$!

* center: (h, k)

* you move "a" distance in the x-direction & move "b" distance in the y-direction

* vertices: you will plot 4 points, but only the two that are on the major axis are considered vertices.

* major axis: longest one $\rightarrow 2a$ units

* minor axis: shortest one $\rightarrow 2b$ units

* foci: two points on the major axis "c" units from the center

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

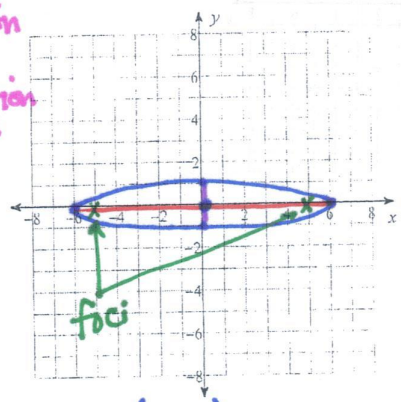
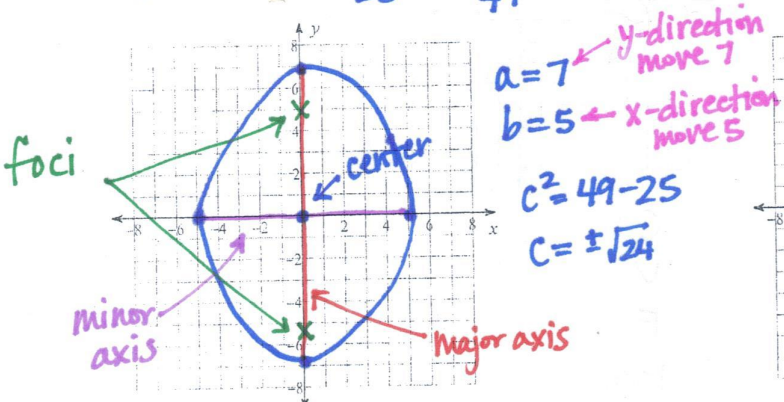
* ellipse centered @ the origin: $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ OR $\frac{y^2}{a^2} + \frac{x^2}{b^2} = 1$

Ellipses Notes

Identify the center, vertices, foci, length of the major axis, and length of the minor axis of each. Then sketch the graph.

1) $\frac{x^2}{25} + \frac{y^2}{49} = 1$ $\frac{(x-0)^2}{25} + \frac{(y-0)^2}{49} = 1$

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



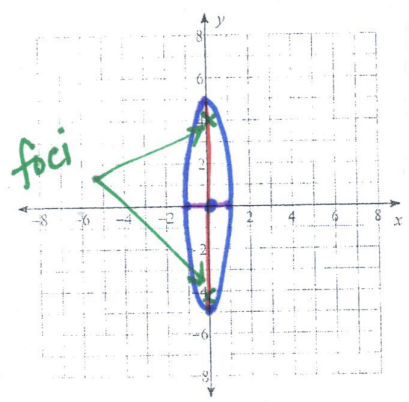
$a=6$ ← x-direction move 6
 $b=1$ ← y-direction move 1
 $c^2=36-1$
 $c=\sqrt{35}$

C: (0,0)
 V: (0,7) & (0,-7)
 F: (0,0+√24) & (0,0-√24): (0,√24) & (0,-√24)
 Maj: 14 units
 Min: 10 units

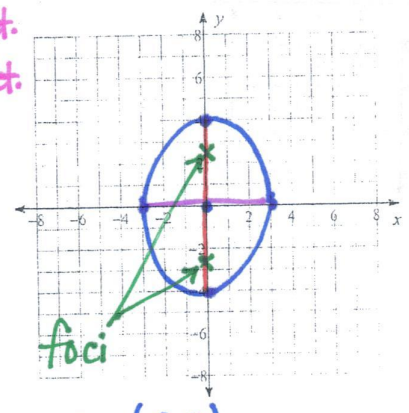
C: (0,0)
 V: (-6,0) & (6,0)
 F: (0+√35,0) & (0-√35,0): (√35,0) & (-√35,0)
 Maj: 12 units
 Min: 2 unit

3) $x^2 + \frac{y^2}{25} = 1$

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



$a=5$ ← y-direct.
 $b=1$ ← x-direct.
 $c^2=25-1$
 $c=\sqrt{24}$

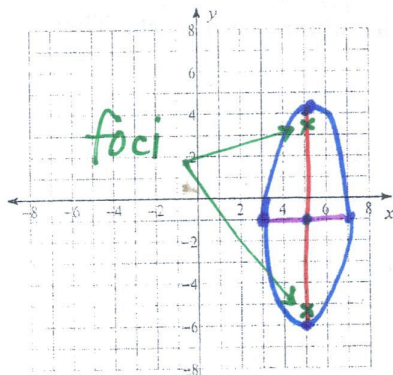


$a=4$
 $b=3$
 $c^2=16-9$
 $c=\sqrt{7}$

C: (0,0)
 V: (0,5) & (0,-5)
 F: (0,0+√24) & (0,0-√24): (0,√24) & (0,-√24)
 Maj: 10 units
 Min: 2 unit

C: (0,0)
 V: (4,0) & (-4,0)
 F: (0,0+√7) & (0,0-√7): (0,√7) & (0,-√7)
 Maj: 8 units
 Min: 6 units

$$5) \frac{(x-5)^2}{4} + \frac{(y+1)^2}{25} = 1$$

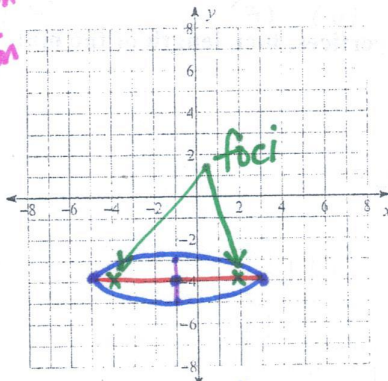


$a=5 \leftarrow y\text{-direction}$
 $b=2 \leftarrow x\text{-direction}$

$c^2 = 25 - 4$
 $c = \pm\sqrt{21}$

C: (5, -1)
 V: (5, 4) \neq (5, -6)
 F: (5, -1 + $\sqrt{21}$) \neq (5, -1 - $\sqrt{21}$)
 Maj: 10 units
 Min: 4 units

$$6) \frac{(x+1)^2}{16} + (y+4)^2 = 1$$

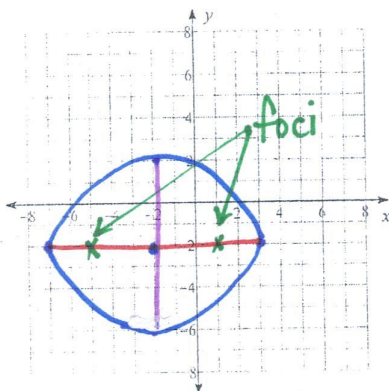


$a=4 \leftarrow x\text{-direct.}$
 $b=1 \leftarrow y\text{-direct.}$

$c^2 = 16 - 1$
 $c = \pm\sqrt{15}$

C: (-1, -4)
 V: (-5, -4) \neq (3, -4)
 F: (-1 + $\sqrt{15}$, -4) \neq (-1 - $\sqrt{15}$, -4)
 Maj: 8 units
 Min: 2 unit

$$7) \frac{(x+2)^2}{25} + \frac{(y+2)^2}{16} = 1$$

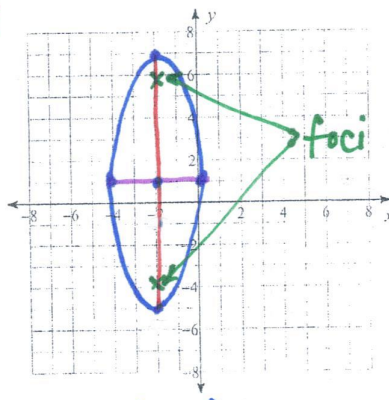


$a=5 \leftarrow x\text{-direct}$
 $b=4 \leftarrow y\text{-direct}$

$c^2 = 25 - 16$
 $c = \pm 3$

C: (-2, -2)
 V: (-7, -2) \neq (3, -2)
 F: (-2 + 3, -2) \neq (-2 - 3, -2) = (1, -2) \neq (-5, -2)
 Maj: 10 units
 Min: 8 units

$$8) \frac{(x+2)^2}{4} + \frac{(y-1)^2}{36} = 1$$



$a=6 \leftarrow y\text{-direct.}$
 $b=2 \leftarrow x\text{-direct.}$

$c^2 = 36 - 4$
 $c = \pm\sqrt{32}$

C: (-2, 1)
 V: (-2, 7) \neq (-2, -5)
 F: (-2, 1 + $\sqrt{32}$) \neq (-2, 1 - $\sqrt{32}$)
 Maj: 12 units
 Min: 4 units