Translating Ellipses

The keys to all of these problems will be:

1. The coordinates of the CENTER.
   Everthing will will be measured from the center.

2. **a** Distance from Center to Vertices

   b Distance from Center to Co-Vertices

   c Distance from Center to Foci

$a^2 > b^2$

Major Axis: Horizontal

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

Major Axis: Vertical

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

Center of the Ellipse: (h,k)

Relationship between a, b, and c

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

Use this equation to find the following coordinates:

$$\frac{(x-1)^2}{41}+\frac{(y+8)^2}{16}=1$$

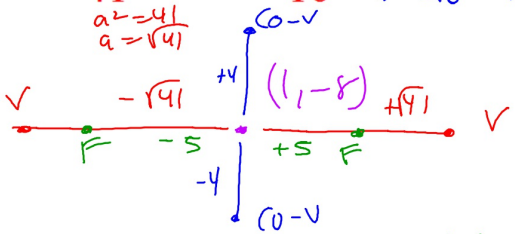
$a^2=41$, $a=\sqrt{41}$; $b^2=16$, $b=4$

Center: $(1,-8)$

Vertices: $(1\pm\sqrt{41},-8)$

Co-Vertices: $(1,-4)$, $(1,-12)$

Foci: $(6,-8)$, $(-4,-8)$



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

$c^2=41-16$

$c^2=25 \rightarrow c=5$

Use this equation to find the following coordinates:

$$\frac{(x+7)^2}{81}+\frac{(y-5)^2}{144}=1$$

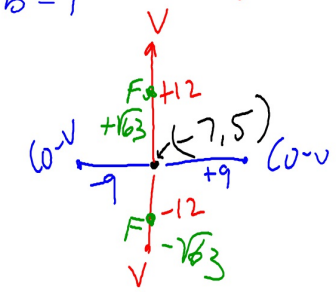
$b^2=81$, $b=9$; $a^2=144$, $a=12$

Center: $(-7,5)$

Vertices: $(-7,17)$, $(-7,-7)$

Co-Vertices: $(2,5)$, $(-16,5)$

Foci: $(-7,5\pm\sqrt{63})$



$c^2=144-81$

$c^2=63$

$c=\sqrt{63}$

Write the equation of this Ellipse:

Center is (3,5)

Major Axis is vertical with a length of 20

A focus is at (3,9)

$c=4 \rightarrow c^2=16$

$2a=20$, $a=10$, $a^2=100$

$$\frac{(x-3)^2}{84}+\frac{(y-5)^2}{100}=1$$

b^2 a^2

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

$16=100-b^2$

$b^2=84$

Write the equation of this Ellipse:

Foci are (-11,1) and (3,1) $c=7$ $c^2=49$ center $(-4,1)$

Co-Vertices are (-4,4) and (-4,-2) $b=3 \rightarrow b^2=9$

$$1=\frac{(x+4)^2}{58}+\frac{(y-1)^2}{9}$$

$49=a^2-9$

$58=a^2$

Write the equation of this Ellipse:

Vertices are (11,-3) and (-17,-3)

center $\left(\frac{11+-17}{2}, \frac{-3+-3}{2}\right)$

Length of the Minor Axis is 8 → $8=2b$, $4=b \rightarrow b^2=16$

center $(-3, -3)$

$$\frac{(x+3)^2}{196} + \frac{(y+3)^2}{16} = 1$$

$a = 14$

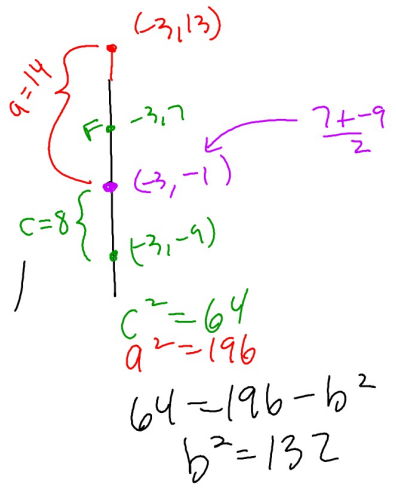
$a^2 = 196$

Write the equation of this Ellipse:

A Vertex: (-3,13)

Foci: (-3, -9) and (-3, 7)

center $=(-3,-1)$



$$\frac{(x+3)^2}{132} + \frac{(y+1)^2}{196} = 1$$

$c^2 = 64$

$a^2 = 196$

$64 = 196 - b^2$

$b^2 = 132$

You can now finish Hwk #24.

Practice Sheet: Tranformations of an Ellipse