10.4 Ellipses with center at (h, k)

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

majoraxis(x)

b^2 $\qquad$ $a^2 \leftarrow$ y major axis

ex1 $\frac{(x-3)^2}{9} + \frac{(y+4)^2}{16} = 1$

center: (3, -4) $\qquad$ major(y)

$a = 4$
$b = 3$

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

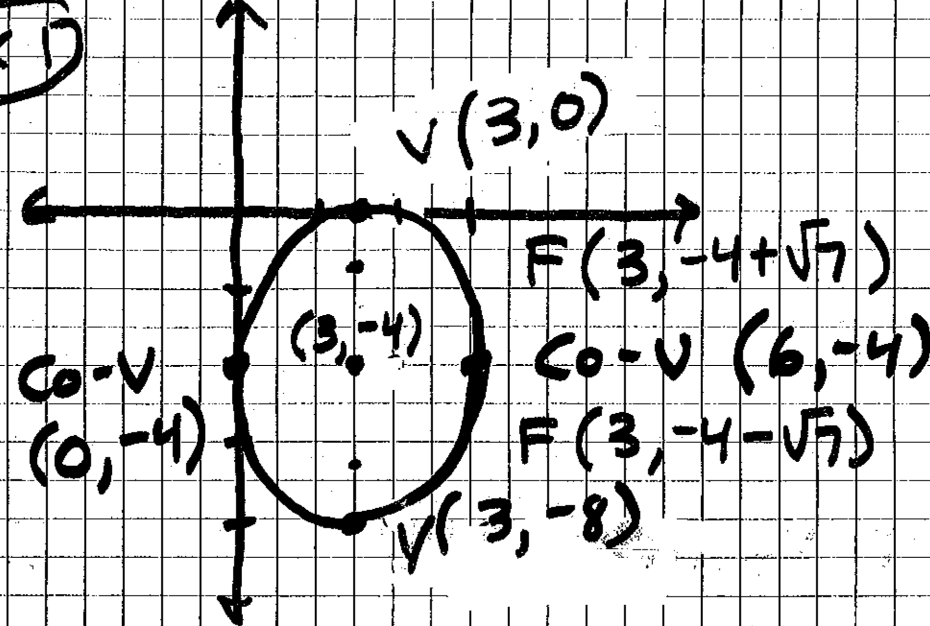
ex2 $\frac{(x+1)^2}{49} + \frac{(y+2)^2}{25} = 1$

(-1, -2) $\qquad$ $c^2 = 49 - 25 = \sqrt{24}$

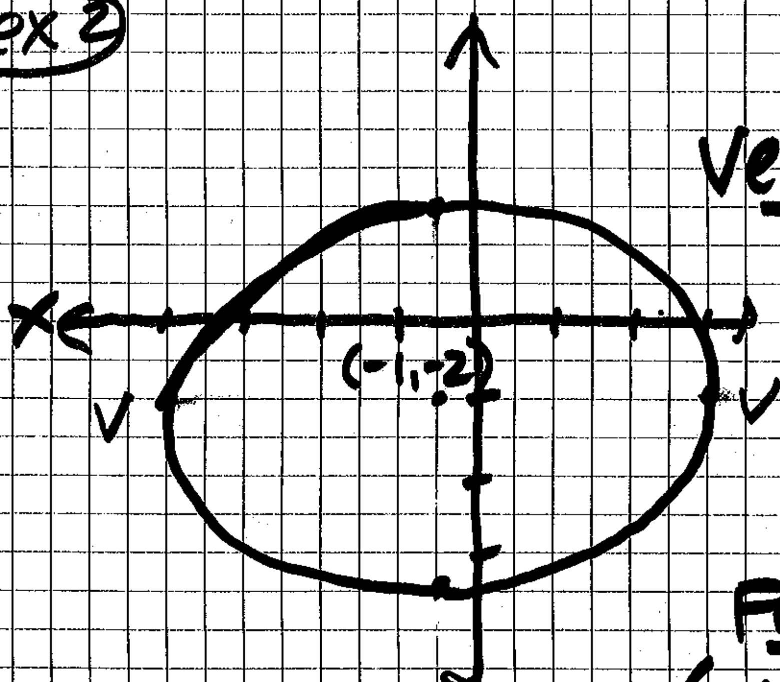
$4 \; 6$

$a = 7$ $\qquad$ $c = 2\sqrt{6}$
$b = 5$

ex 1



ex 2



Vertices: $(-8,-2)$
$(6,-2)$

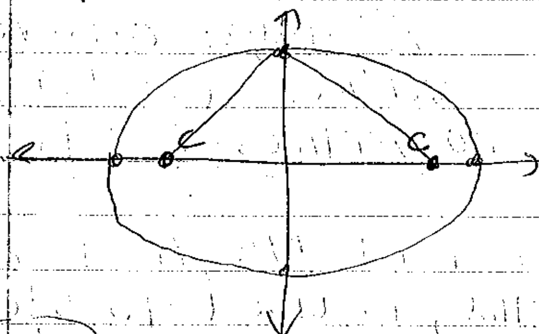
co-vertices:
$(-1,-7)$ $(-1,3)$

Foci:
$(-1+2\sqrt{6},-2)$
$(-1-2\sqrt{6},-2)$

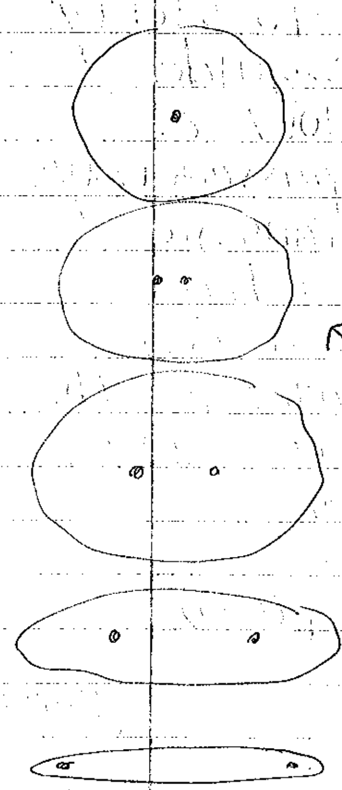
x-value center
add + subtract "c" from it

The Foci are important points in an ellipse. For example, in Earth's orbit around the sun, the sun is at a Focus, not at the center.

- the Foci of an ellipse are always on the major axis and are c units From the center.



$$c^2 = a^2 - b^2$$
$$c = \sqrt{a^2 - b^2}$$



The eccentricity of an ellipse is a measure of its ovalness. it is given by $\frac{c}{a}$

IF an ellipse is nearly circular
- the Foci are close to the center
∴ the eccentricity, given by $\frac{c}{a}$ is close to 0.

IF the ellipse is very elongated then the Foci are close to the vertices and the eccentricity is close to 1.

Ellipses day 3 3/8

ex $25x^2+16y^2+150x = 160y-225$

$-160y \quad -160y$

$25x^2+150x+16y^2-160y = -225$

$25(x^2+6x+\boxed{9})+16(y^2-10y+\boxed{25}) = -225 + 25\boxed{9} + 16\boxed{25}$

$$\frac{25(x+3)^2}{400}+\frac{16(y-5)^2}{400}=\frac{400}{400}$$

$$\boxed{\frac{(x+3)^2}{16}+\frac{(y-5)^2}{25}=1}$$

$b^2 \qquad a^2$

$b=4 \qquad a=5$

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

$c^2=25-16$

$\sqrt{c^2}=\sqrt{9}$

$c=3$

major: y

center: $(-3,5)$

vertices: $(-3,10)$ $(-3,0)$

co-vertices: $(-7,5)$ $(1,5)$

Foci:

$(-3,8)\ (-3,2)$

eccentricity: $\frac{3}{5}=.6$

$$2x^2+8x+y^2+4=0$$

$$2x^2+8x+y^2=-4$$

$$2(x^2+4x+\boxed{4})+y^2=-4+\overset{8}{2\boxed{4}}$$

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

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

center: $(-2,0)$

$b^2=2$ $\quad$ $a^2=4$

major y

$b=\sqrt{2}$ $\quad$ $a=2$

vertices: $(-2,2)(-2,-2)$

$c=\sqrt{2}$

Co-vertices: $(-2\pm\sqrt{2},0)$

$$c^2=a^2-b^2$$
$$=4-2$$
$$\sqrt{c^2}=\sqrt{2}$$

Foci $(-2,\pm\sqrt{2})$

Name_______________________________ Ellipses

Put each ellipse in standard form if necessary. Find the pertinent information. Sketch the graph.

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

Major axis:________________
Vertices:________________
Co-vertices:________________
Foci:________________
Center:________________
eccentricity:________________

2.) $\frac{x^2}{36} + \frac{y^2}{20} = 1$

Major axis:________________
Vertices:________________
Co-vertices:________________
Foci:________________
Center:________________
eccentricity ________________

3.) $\frac{(x+5)^2}{9} + \frac{(y-3)^2}{3} = 1$

Major axis:________________
Vertices:________________
Co-vertices:________________
Foci:________________
Center:________________
eccentricity:________________

4.) $169x^2 + 25y^2 = 4225$

Major axis:________________
Vertices:________________
Co-vertices:________________
Foci:________________
Center:________________
eccentricity:________________

5.) $9x^2 + 25y^2 + 72x - 150y = -144$

Major axis:________________
Vertices:________________
Co-vertices:________________
Foci:________________
Center:________________
eccentricity:________________

Name________________________________ Ellipses

6.) $x^2 + 4y^2 - 2x + 24y + 33 = 0$

Major axis:____________________
Vertices:______________________
Co-vertices:___________________
Foci:__________________________
Center:________________________
eccentricity: _________________

7.) $9x^2 + 16y^2 = 144$

Major axis:____________________
Vertices:______________________
Co-vertices:___________________
Foci:__________________________
Center:________________________
eccentricity: _________________

8.) $9x^2 + 25y^2 + 54x + 200y = -256$

Major axis:____________________
Vertices:______________________
Co-vertices:___________________
Foci:__________________________
Center:________________________
eccentricity: _________________

9.) $4x^2 + y^2 - 32x - 4y + 52 = 0$

Major axis:____________________
Vertices:______________________
Co-vertices:___________________
Foci:__________________________
Center:________________________
eccentricity: _________________