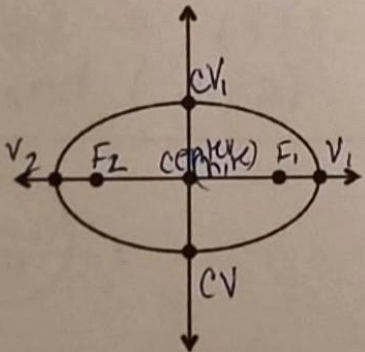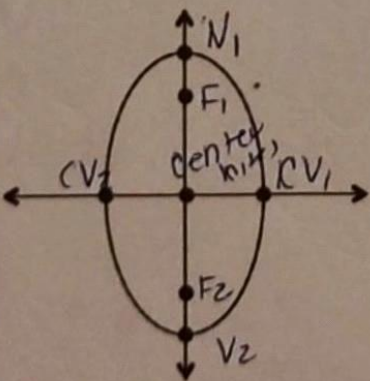# Ellipses

- An Ellipse is sometimes referred to as an ___oval___.
- The denominators of the equation determine how ___long___ and ___wide___ the graph is.
- The major axis is the ___large___ axis of the ellipse.
- The minor axis is the ___small___ axis of the ellipse.
- The Vertices are the end points of the ___major___ axis.
- The Co-vertices are the end points of the ___minor___ axis.
- The ___foci___ of an ellipse are the 2 points whose sum of distances from any point on the ellipse is always the same.
- The Foci points always lie on the ___major___ axis.
- For ellipses, "a" is always ___bigger___.

Standard Form	Orientation	Description
$$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$$ Where $c^2 = a^2 - b^2$		Center: (h, k) Foci: $(h \pm c, k)$ Major Axis: x-axis Major Axis vertices: $(h \pm a, k)$ Minor Axis: y-axis Co-vertices: $(h, k \pm b)$
$$\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1$$ Where $c^2 = a^2 - b^2$		Center: (h, k) Foci: $(h, k \pm c)$ Major Axis: y-axis Major Axis vertices: $(h, k \pm a)$ Minor Axis: x-axis Co-vertices: $(h \pm b, k)$

Graph the following:

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

$\sqrt{25}$ $\sqrt{4}$

$a = \underline{5}$ $b = \underline{2}$

Center: $(\underline{4}, \underline{-2})$

Vertices: $(4 \pm 5, -2)$
$(9, 2), (-1, -2)$

Co-Vertices: $(4, -2 \pm 2)$
$(4, 0), (4, -4)$

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

$\sqrt{c^2} = \sqrt{25-4}$
$c = \pm\sqrt{21}$ or $c = \pm 4.6$

Foci Points: $(4 \pm 4.6, -2) \rightarrow (4 \pm \sqrt{21}, -2)$
$(8.6, -2)$ and $(-.6, -2)$ OR $(4 \pm \sqrt{21}, -2)$
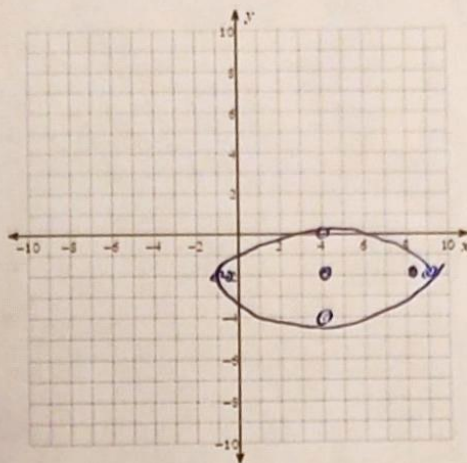
Graph the following:

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

$\sqrt{25}$ $\sqrt{16}$

$a = \underline{5}$ $b = \underline{4}$

Center: $(\underline{-1}, \underline{2})$

Vertices: $(-1, 2 \pm 5)$
$(-1, 7), (-1, -3)$

Co-Vertices: $(-1 \pm 4, 2)$
$(-5, 2), (3, 2)$

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

$\sqrt{c^2} = \sqrt{25-16}$
$c = \pm\sqrt{9} = \pm 3$

Foci Points: $(-1, 2 \pm 3)$
$(-1, 5), (-1, -1)$