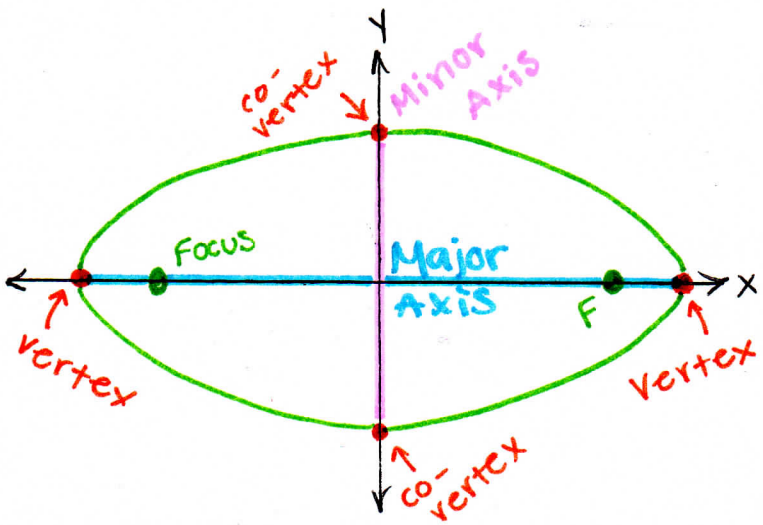
CONICS
Lesson 3 - Ellipses

Def: The set of all points in a plane whose dist. from two fixed points (foci) are a constant sum.



Major Axis: the longer axis (could be vertical)

Minor Axis: the shorter axis.

Standard Form

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

Center: (h, k)

Horiz. Axis: $2a$

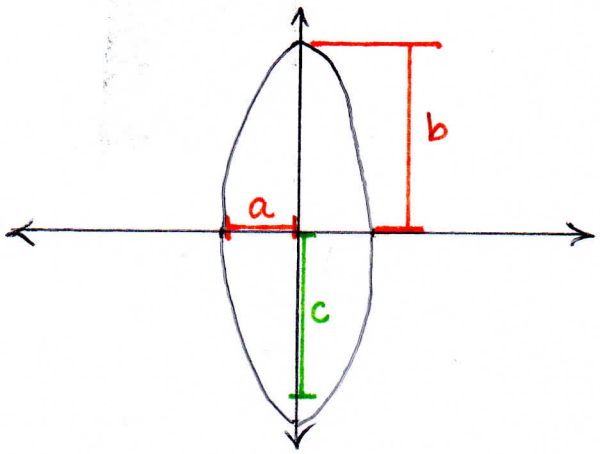
Vert. Axis: $2b$

Vertices: end points of major axis

Co-Vertices: end points of minor axis

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

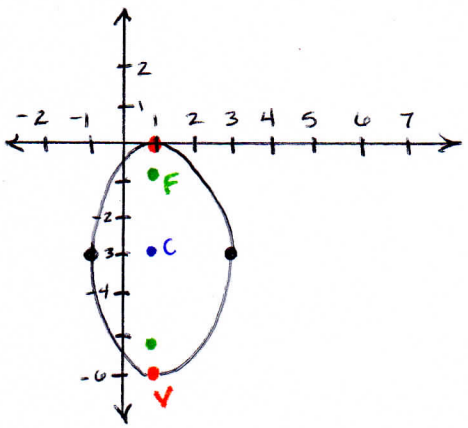
c: distance along major axis between center and focus points (foci)



Ex.1] $\frac{(x-1)^2}{4} + \frac{(y+3)^2}{9} = 1$

$a = 2$ * center to co-vertices (H)

$b = 3$ * center to vertices (V)



center: $(1, -3)$

vertices: $(1, 0), (1, -6)$

foci: $(1, -3 \pm \sqrt{5})$

$|4 - 9| = 5$

$c = \sqrt{5}$ * center to foci

Ex.2] "Prove" an Ellipse

$3x^2 + 5y^2 - 12x + 30y + 42 = 0$

$3x^2 - 12x + 5y^2 + 30y = -42$

$3(x^2 - 4x + \underline{4}) + 5(y^2 + 6y + \underline{9}) = -42 + \underline{12} + \underline{45}$

$3(x-2)^2 + 5(y+3)^2 = 15$ * because of GCF

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