

THE ELLIPSE

$C = (h, k)$

$V_1 = (h-a, k)$

$V_2 = (h+a, k)$

$F_1 = (h-c, k)$

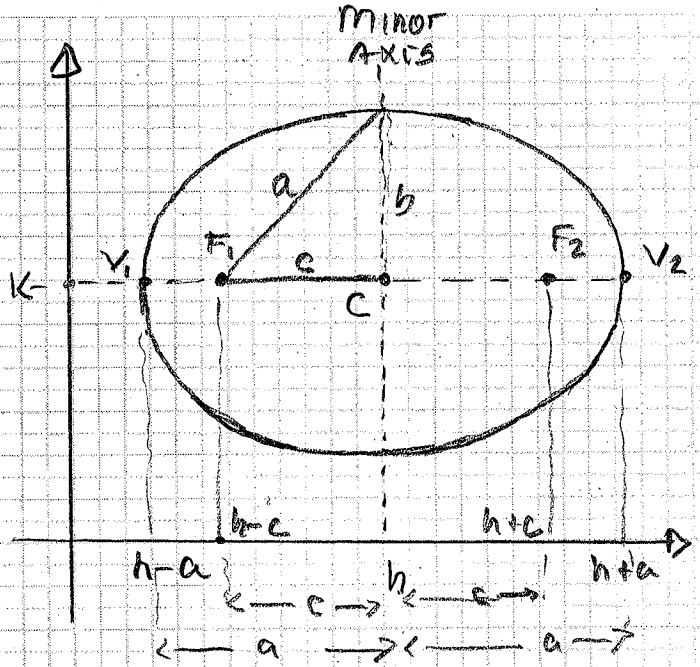
$F_2 = (h+c, k)$

MAJOR AXIS
 $y = k$

$a > b$



$a^2 = c^2 + b^2$



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

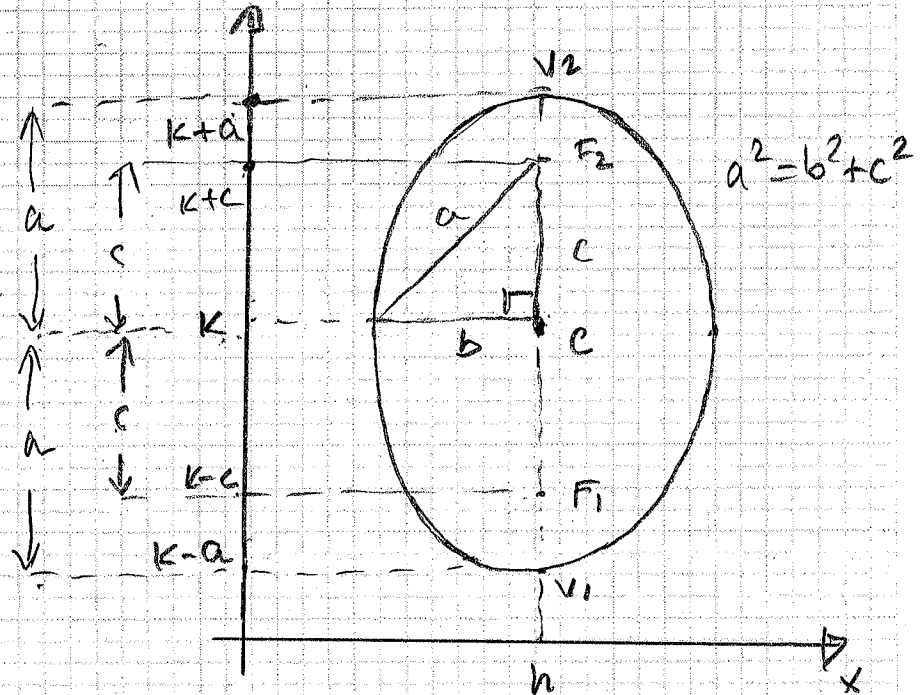
$C = (h, k)$

$V_1 = (h, k-a)$

$V_2 = (h, k+a)$

$F_1 = (h, k-c)$

$F_2 = (h, k+c)$



$a^2 = b^2 + c^2$

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

EX: $\frac{(x-2)^2}{25} + \frac{(y-3)^2}{36} = 1$

$a^2 = 36 \Rightarrow a = 6$ $b^2 = 25 \Rightarrow b = 5$

major Axis $x = h$

ex 1: Find the equation of the ellipse with center at $(5, 4)$, one focus at $(5, 6)$ and one vertex at $(5, 1)$

$$C = \begin{pmatrix} h \\ k \end{pmatrix} = (5, 4)$$

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

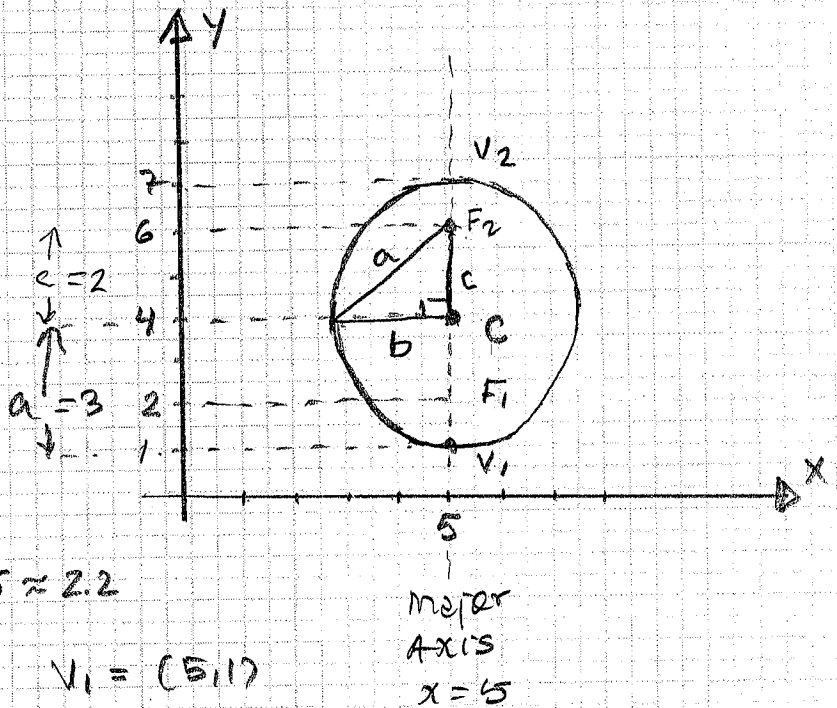
$$a = 3 \quad c = 2$$

$$a^2 = b^2 + c^2$$

$$9 = b^2 + 4$$

$$b^2 = 9 - 4 = 5 \Rightarrow b = \sqrt{5} \approx 2.2$$

$$\boxed{\frac{(x-5)^2}{5} + \frac{(y-4)^2}{9} = 1}$$



$$V_1 = (5, 1)$$

$$F_1 = (5, 2)$$

$$V_2 = (5, 7)$$

$$F_2 = (5, 6)$$

ex: Discuss the equation

$$5x^2 + 9y^2 - 40x - 90y + 260 = 0$$

$$5x^2 - 40x + 9y^2 - 90y = -260$$

$$5(x^2 - 8x + 16) + 9(y^2 - 10y + 25) = -260 + 80 + 225$$

$$5(x-4)^2 + 9(y-5)^2 = -260 + 80 + 225$$

$$5(x-4)^2 + 9(y-5)^2 = 45$$

$$\frac{(x-4)^2}{9} + \frac{(y-5)^2}{5} = 1$$

$$C = (4, 5)$$

$$a^2 = 9 \Rightarrow a = 3$$

$$b^2 = 5 \Rightarrow b = \sqrt{5} \approx 2.2$$

$$V_1 = (7, 5) \quad V_2 = (1, 5)$$

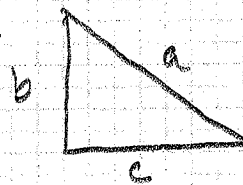
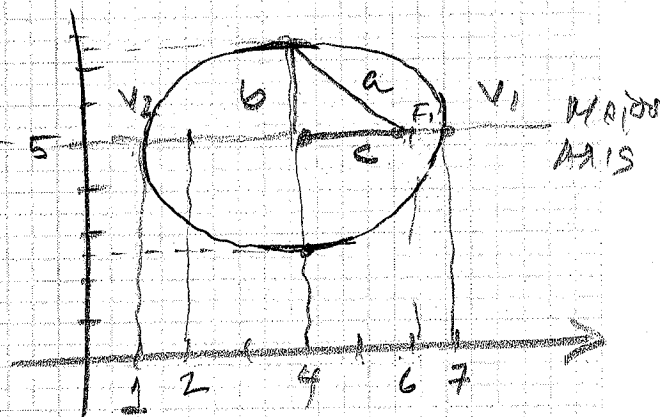
$$a^2 = b^2 + c^2$$

$$9 = 5 + c^2 \Rightarrow c^2 = 9 - 5 = 4$$

$$c = 2$$

$$F_1 = (6, 5)$$

$$F_2 = (2, 5)$$



Major Axis: $y = 5$