

THE HYPERBOLA

$C = (h, k)$

$F_1 = (h+c, k)$

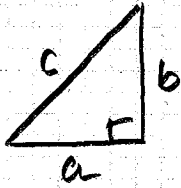
$F_2 = (h-c, k)$

$V_1 = (h+a, k)$

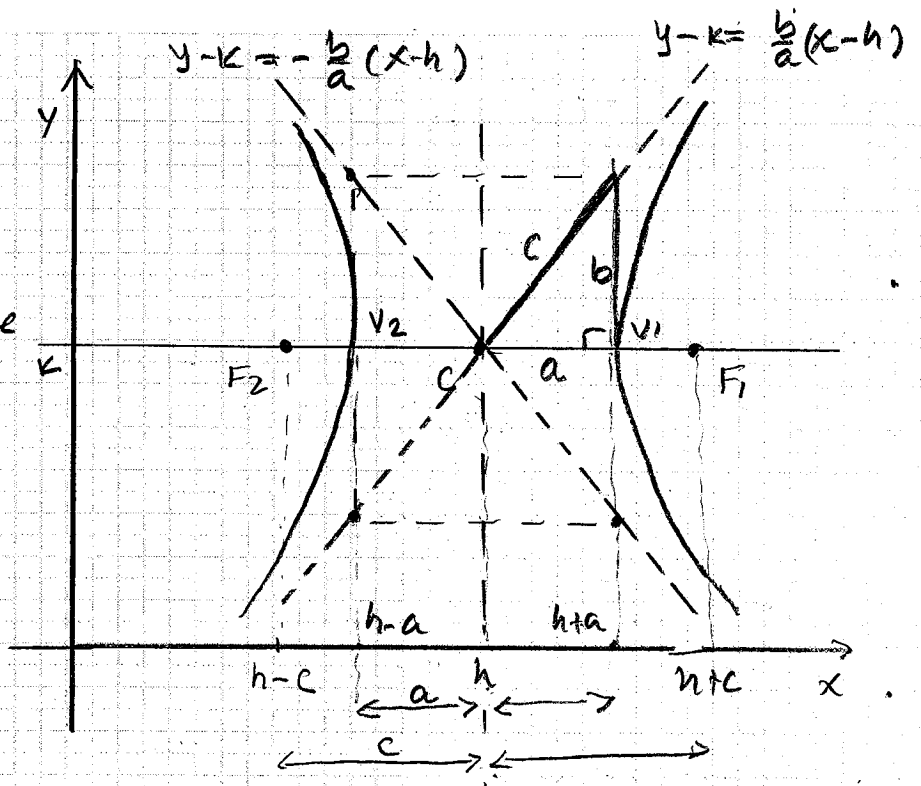
$V_2 = (h-a, k)$

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

i.e: $a^2 + b^2 = c^2$



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

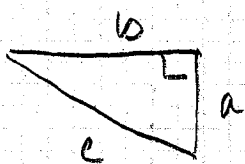


conjugate axis

Equation of Transverse Axis : $y = k$

conjugate axis : $x = h$

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



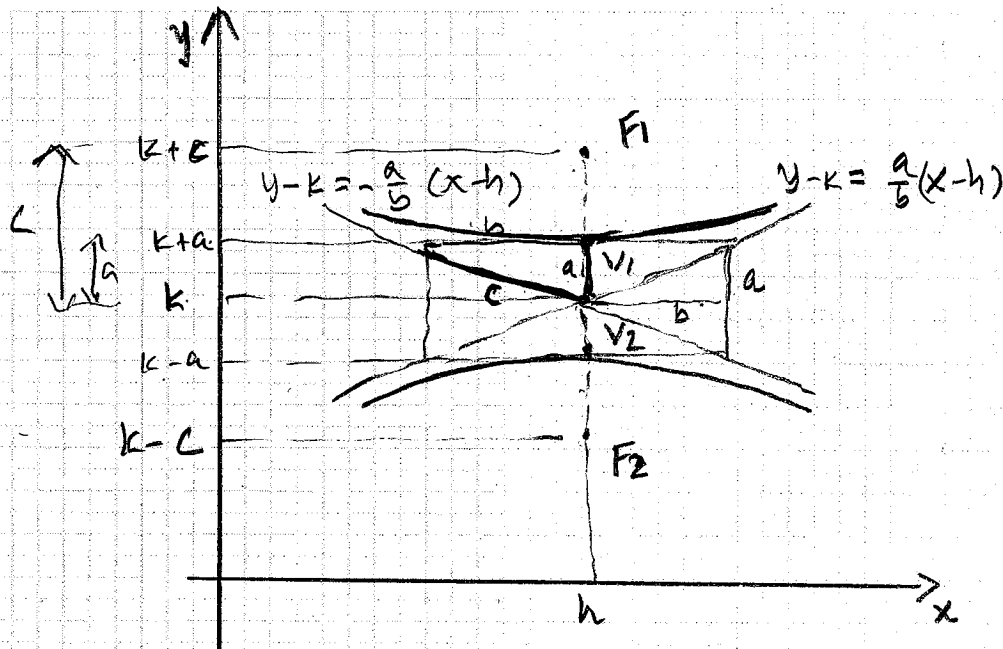
$$C = (h, k)$$

$$V_1 = (h, k+a)$$

$$V_2 = (h, k-a)$$

$$F_1 = (h, k+c)$$

$$F_2 = (h, k-c)$$



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

Equation of
the transverse
Axis

$$x = h$$

Equation of
the conjugate
Axis

$$y = k$$

Exercises

1) Given $C = (-3, 4)$ $F_1 = (-7, 4)$ $V_2 = (0, 4)$

Find the equation of the hyperbola

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

$$h = -3 \quad k = 4$$

$$a = 3 \quad c = 4$$

$$a^2 + b^2 = c^2 \Rightarrow b^2 = 4^2 - 3^2$$

$$b^2 = 16 - 9 = 7 \Rightarrow b = \sqrt{7} \approx 2.6$$

Equation of
the hyperbola

$$\frac{(x+3)^2}{9} - \frac{(y-4)^2}{7} = 1$$

$$F_2 = (1, 4)$$

$$V_1 = (-6, 4)$$

Asymptotes: $y - k = \frac{b}{a}(x - h)$

$$y - 4 = \frac{\sqrt{7}}{3}(x + 3)$$

$$y - 4 = -\frac{\sqrt{7}}{3}(x + 3)$$

Equation of
transverse
Axis

$$y = 4$$

Conjugate
Axis

$$x = -3$$

