

Notes Section 7.3 - Hyperbolas

standard equation of a hyperbola

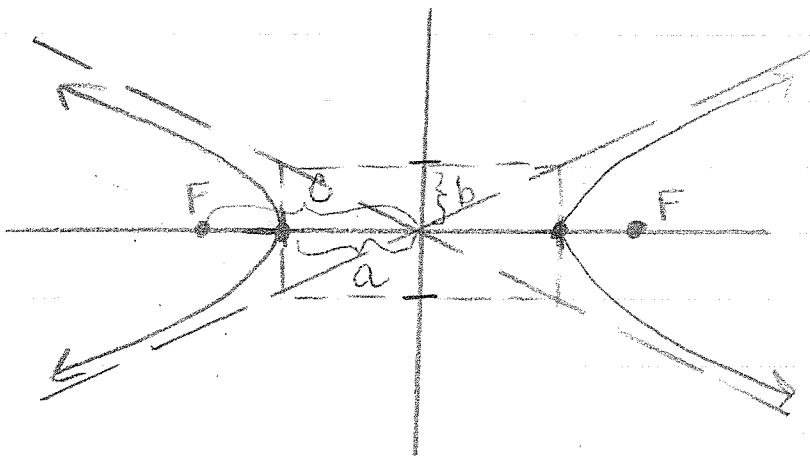
$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1 \quad \frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$$



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

transverse: $2a$
conjugate: $2b$

transverse axis - connects the vertices



example 1

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

$C(-2, -4)$

$F(-2, -4 \pm \sqrt{5})$

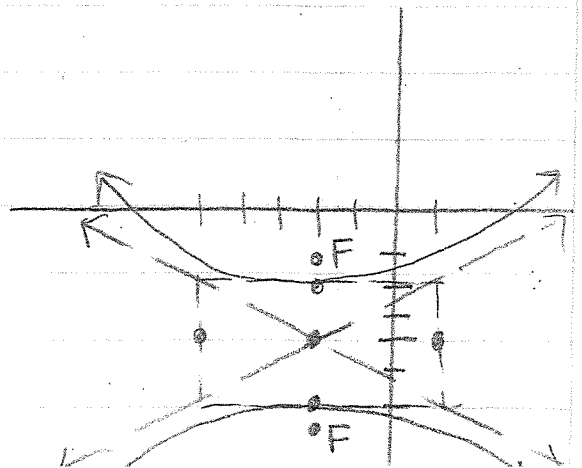
$c^2 = 9 - 4$

asymptotes:

$c = \sqrt{5}$

$y = \frac{2}{3}x - \frac{16}{3}$

$y = -\frac{2}{3}x - \frac{8}{3}$



example 2

graph $4x^2 - y^2 + 24x + 4y = 32$

$$4(x^2 + 6x + 9) - (y^2 - 4y + 4) = 32 + 36 - 4$$

$$4(x+3)^2 - (y-2)^2 = 64$$

$$\frac{(x+3)^2}{16} - \frac{(y-2)^2}{64} = 1$$

$$C(-3, 2)$$

$$c^2 = 64 + 16$$

$$c = \sqrt{80} = 4\sqrt{5}$$

$$F(-3 \pm 4\sqrt{5}, 2)$$

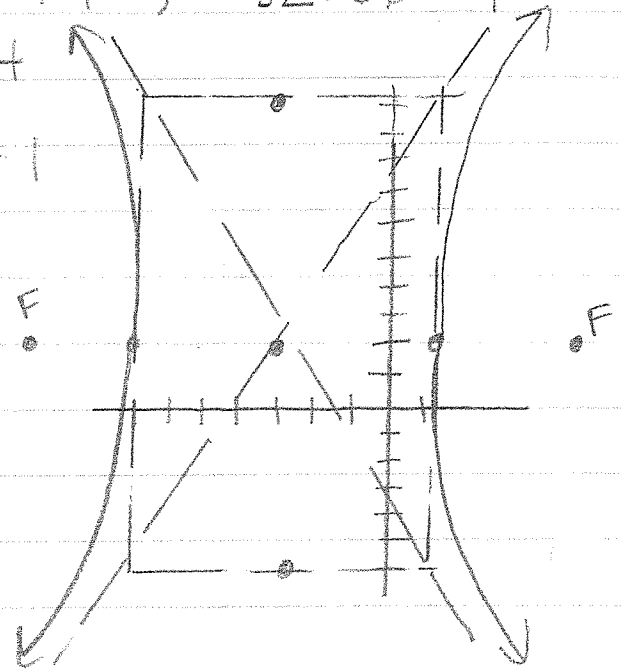
$$y - 2 = 8/4(x + 3)$$

$$y - 2 = 2x + 6$$

$$\underline{y = 2x + 8}$$

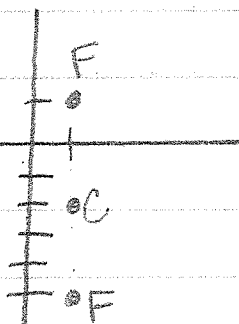
$$y - 2 = -2(x + 3)$$

$$y - 2 = -2x - 6 \rightarrow \underline{y = -2x - 4}$$



example 3

write an equation for the hyperbola
foci (1, -5) (1, 1), transverse is 4 units



$$C(1, -2)$$

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

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

$$4 + b^2 = 9 \quad b = \sqrt{5}$$

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

are identity
mms