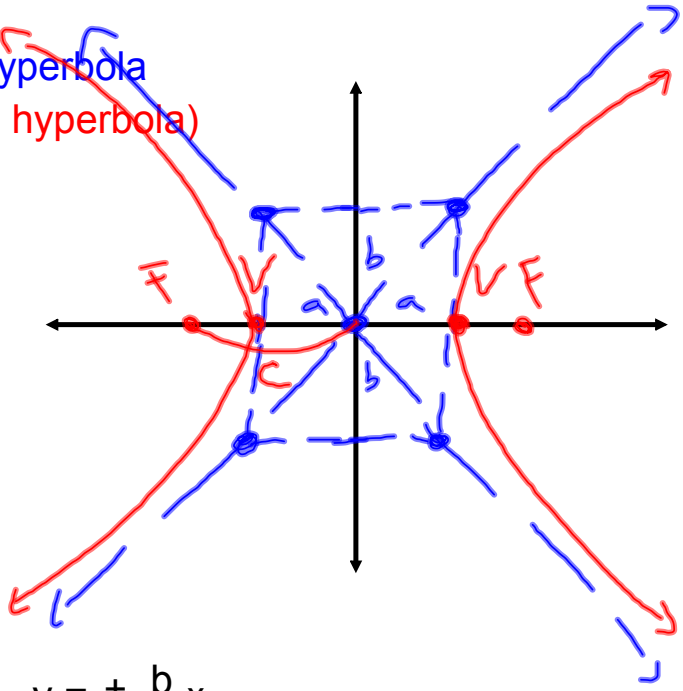
NOTES 11.4 Hyperbolas

"a" is in the front

"x" Hyperbola
(x-action hyperbola)

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$



a = center to vertices

b = center to b vertices

c = center to foci

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

asymptotes: $y = \pm \frac{b}{a} x$

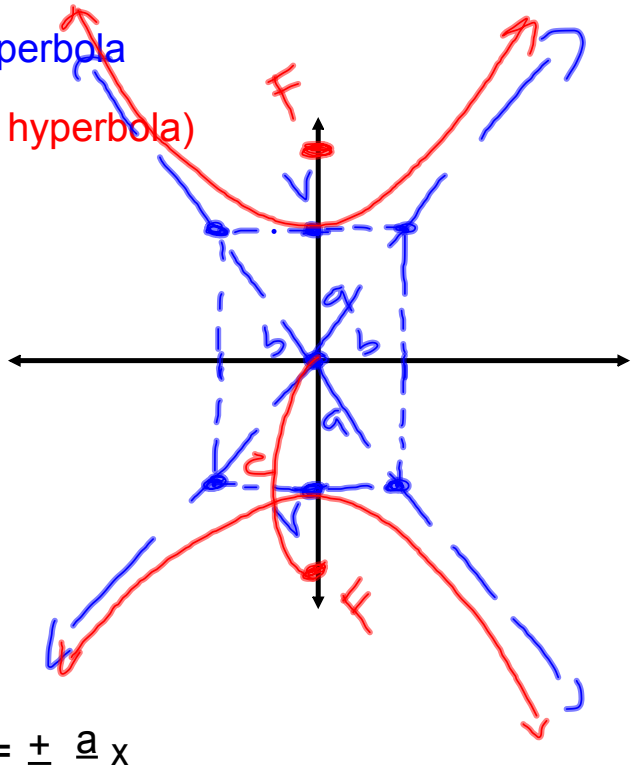
Transverse axis: $y = 0$

Conjugate axis: $x = 0$

"y" Hyperbola

(y-action hyperbola)

$$\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$$



a = center to vertices

b = center to b vertices

c = center to foci

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

asymptotes: $y = \pm \frac{a}{b} x$

Transverse axis: $x = 0$

Conjugate axis: $y = 0$

Ex #1: Graph the hyperbola. Find the foci, vericies, and asymptotes.

a) $\frac{x^2}{9} - \frac{y^2}{25} = 1$

$a = 3$

$b = 5$

$c = \sqrt{34}$

$9 + 25$

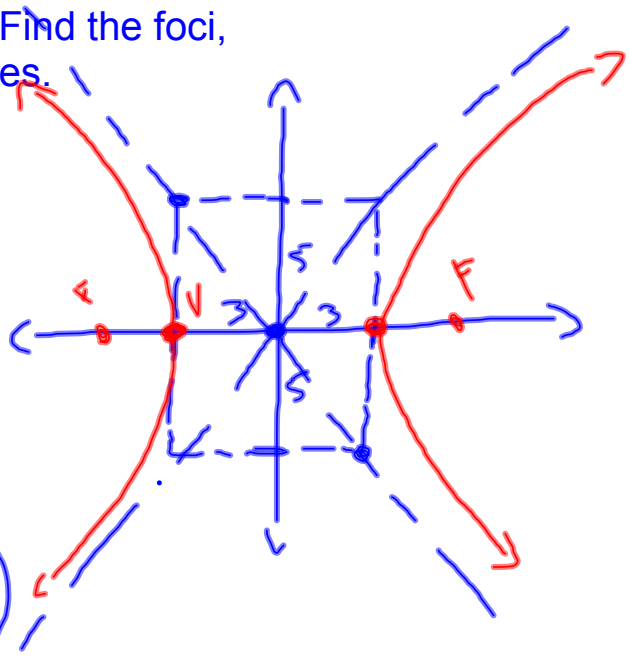
34

$C: (0,0)$

$V: (3,0)\ (-3,0)$

$F: (\sqrt{34},0)\ (-\sqrt{34},0)$

$A: y = \pm\frac{5}{3}x$



b) $\frac{y^2}{144} - \frac{x^2}{9} = 1$

$a = 12$

$b = 3$

$c = 3\sqrt{17}$

$144 + 9$

153

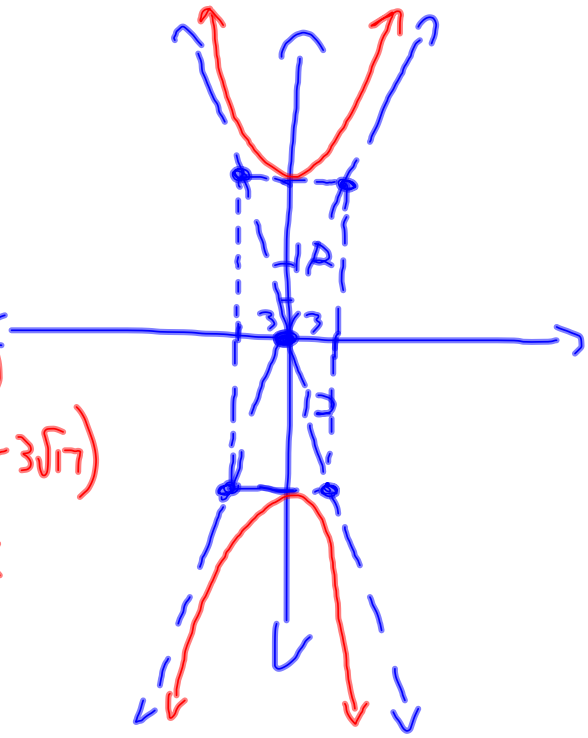
$\sqrt{153}$

C: $(0,0)$

V: $(0,12)(0,-12)$

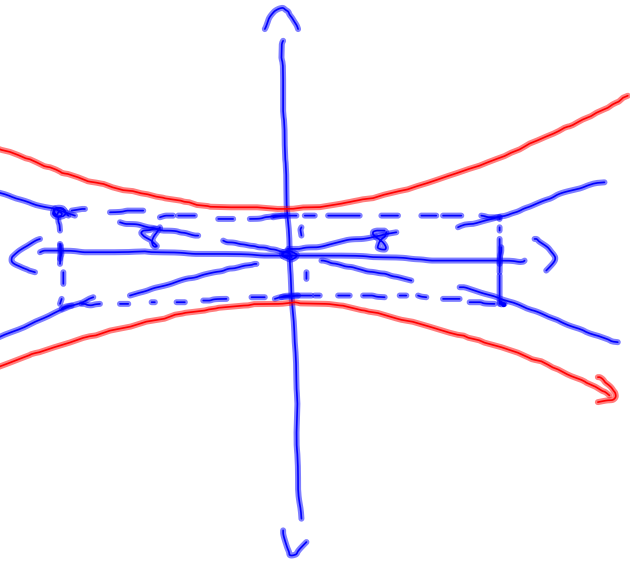
F: $(0,3\sqrt{17})(0,-3\sqrt{17})$

A: $y = \pm 4x$



c) $\frac{64y^2}{64} - \frac{x^2}{64} = \frac{64}{64}$

$\frac{y^2}{1} - \frac{x^2}{64} = 1$



$a = 1$

$b = 8$

$c = \sqrt{65}$

$64 + 1$

65

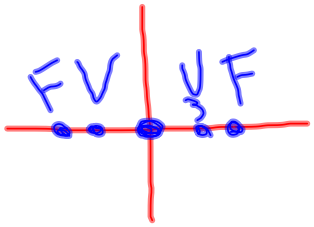
$C: (0,0)$

$V: (0,1)(0,-1)$

$F: (0,\sqrt{65}), (0,-\sqrt{65})$

$A: y = \pm \frac{1}{8}x$

Ex #2: Write the equation of the hyperbola when its center is (0,0), foci (-3,0) & (3,0), and verticies (-2,0) & (2,0)



$a = 2$

$b =$

$c = 3$

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

$9 = 4 + b^2$

$b^2 = 5$

$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

$\frac{x^2}{4} - \frac{y^2}{5} = 1$

Ex #3: Find the foci of the hyperbola when the vertices are (0,3) & (0,-3) and the asymptotes are y = 2x & y = -2x

$a = 3$

$b = \frac{3}{2}$

$c = \frac{3\sqrt{5}}{2}$

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

$c^2 = 9 + \frac{9}{4}$

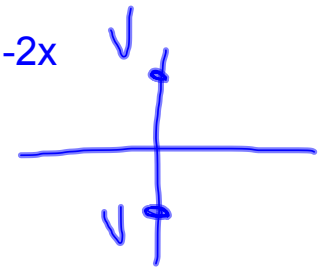
$= \frac{36}{4} + \frac{9}{4}$

$c^2 = \frac{45}{4}$

$\frac{3\sqrt{5}}{2}$

$F: \left(0, \frac{3\sqrt{5}}{2}\right)$

$\left(0, -\frac{3\sqrt{5}}{2}\right)$



$\frac{2}{1} = \frac{3}{b}$

$2b = 3$

$b = \frac{3}{2}$

Assign # 31

pg594 #1-6, 7-27 odd, 29-32