

# Sec. 8.5 Graph and Write Equations of Hyperbolas

Equation	Transverse Axis	Asymptotes	Vertices
$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$	Horizontal	$y = \pm \frac{b}{a}x$	$(\pm a, 0)$
$\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$	Vertical	$y = \pm \frac{a}{b}x$	$(0, \pm a)$

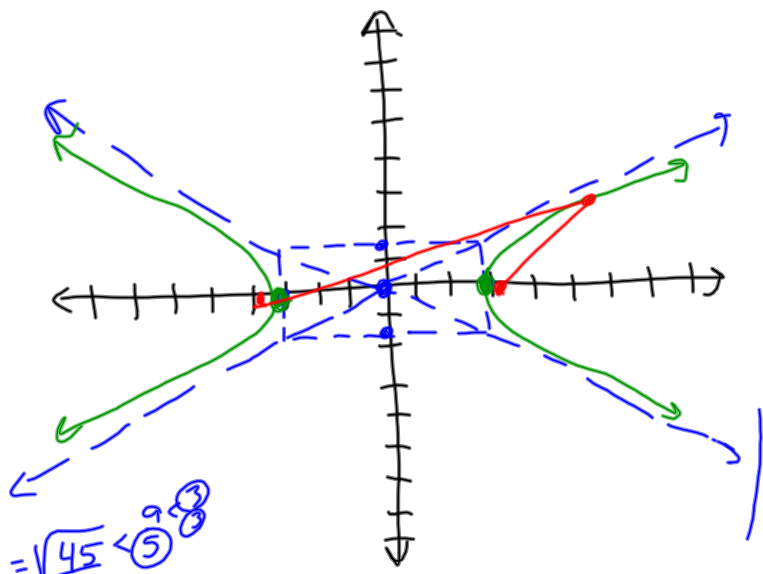
Focus:  $c^2 = a^2 + b^2$

Ex: Graph  $\frac{x^2}{9} - \frac{4y^2}{9} = 1$

$\frac{x^2}{9} - \frac{\frac{1}{4} \cdot 4y^2}{\frac{1}{4} \cdot 9} = 1$

$\frac{x^2}{9} - \frac{y^2}{\frac{9}{4}} = 1$

$\downarrow$                        $\downarrow$   
 3                               $\frac{3}{2}$



vertices:  $(\pm 3, 0)$

foci:  $(\pm \frac{3\sqrt{5}}{2}, 0)$

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

$c^2 = 9 + \frac{9}{4} = \frac{36}{4} + \frac{9}{4} = \frac{45}{4} \leftarrow \frac{9 \cdot 5}{4}$

$c = \frac{3\sqrt{5}}{2} \approx 3.4$

asymptotes:  $y = \pm \frac{3}{3}x$                        $\frac{3}{2} \cdot \frac{1}{3} = \frac{1}{2}$

$y = \pm \frac{1}{2}x$

Graph

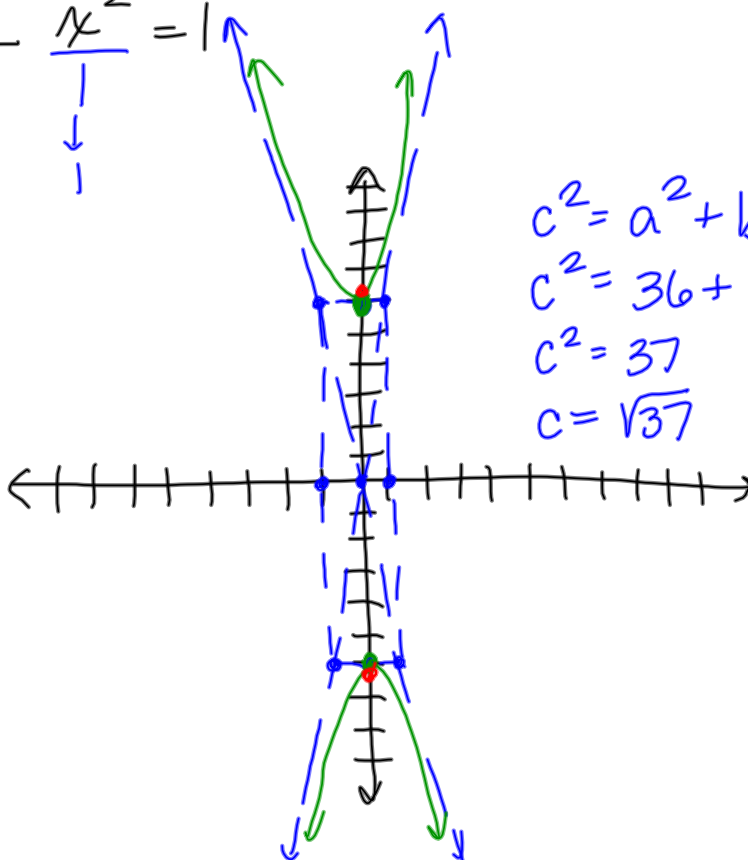
$$m = \frac{6}{1}$$

$$\frac{y^2}{36} - \frac{x^2}{1} = 1$$

vertices:  $(0, \pm 6)$ foci:  $(0, \pm \sqrt{37})$ 

asymptotes:

$$y = \pm 6x$$



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

$$c^2 = 36 + 1$$

$$c^2 = 37$$

$$c = \sqrt{37}$$

Write an equation of the hyperbola:

a. foci:  $(-8, 0), (8, 0)$   $c=8$

vertices:  $(-5, 0), (5, 0)$   
 $a=5$

$$\frac{x^2}{25} - \frac{y^2}{39} = 1$$

$$\begin{aligned} c^2 &= a^2 + b^2 \\ 8^2 &= 5^2 + b^2 \\ 64 &= 25 + b^2 \\ \underline{-25} \quad \underline{-25} \\ 39 &= b^2 \end{aligned}$$

b. foci:  $(0, -10), (0, 10)$   $c=10$

vertices:  $(0, -6), (0, 6)$   $a=6$

$$\frac{y^2}{36} - \frac{x^2}{64} = 1$$

$$\begin{aligned} c^2 &= a^2 + b^2 \\ 10^2 &= 6^2 + b^2 \\ 100 &= 36 + b^2 \\ \underline{-36} \quad \underline{-36} \\ 64 &= b^2 \end{aligned}$$

p. 521 (3-23) eoo (28, 29)