

Find all the information listed below for each equation, and then sketch the graph on a graphing grid. (You do not need to graph the foci)

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

Center: (0, 0)

a = 3

b = 5

c =  $\sqrt{34}$

$$\begin{aligned} c^2 &= a^2 + b^2 \\ c^2 &= 9 + 25 \\ c^2 &= 34 \\ c &= \sqrt{34} \end{aligned}$$

Asy. equations:  $y = \pm 5/3x$

Major axis: H (horizontal or vertical)

Vertices: (3, 0) & (-3, 0)

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

2)  $\frac{y^2}{16} - \frac{x^2}{48} = 1$

Center: (0, 0)

a = 4

b =  $4\sqrt{3}$

c = 8

$$\begin{aligned} c^2 &= a^2 + b^2 \\ c^2 &= 16 + 48 \\ c^2 &= 64 \\ c &= 8 \end{aligned}$$

Asy. equations:  $y = \frac{4}{4\sqrt{3}} = \frac{1}{\sqrt{3}} = \pm \frac{\sqrt{3}}{3}x$

Major axis: V (horizontal or vertical)

Vertices: (0, 4) & (0, -4)

Foci: (0, 8) & (0, -8)

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

Center: (1, 4)

a = 1

b = 2

c =  $\sqrt{5}$

$$\begin{aligned} c^2 &= a^2 + b^2 \\ c^2 &= 1 + 4 \\ c^2 &= 5 \\ c &= \sqrt{5} \end{aligned}$$

Asy. slopes:  $\pm 2$

Major axis: H (horizontal or vertical)

Vertices: (2, 4) & (0, 4)

Foci:  $(1 + \sqrt{5}, 4)$  &  $(1 - \sqrt{5}, 4)$

4)  $\frac{(y+2)^2}{16} - \frac{x^2}{9} = 1$

Center: (0, -2)

a = 4

b = 3

c = 5

$$\begin{aligned} c^2 &= a^2 + b^2 \\ c^2 &= 16 + 9 \\ c^2 &= 25 \\ c &= 5 \end{aligned}$$

Asy. slopes:  $\pm 4/3$

Major axis: V (horizontal or vertical)

Vertices: (0, 2) & (0, -6)

Foci: (0, 3) & (0, -7)

Place the following equations in standard hyperbola form. You do not need to provide info nor graph them.

5)  $\frac{80x^2}{80} - \frac{5y^2}{80} = \frac{80}{80}$

$$x^2 - \frac{y^2}{16} = 1$$

6)  $y^2 - 2y - x^2 + 4x - 7 = 0$

$$y^2 - 2y + \underline{1} - x^2 + 4x = 7 + \underline{1}$$

$$(y-1)^2 - x^2 + 4x = 8$$

$$-(y-1)^2 + x^2 - 4x = -8$$

$$-(y-1)^2 + x^2 - 4x + \underline{4} = -8 + \underline{4}$$

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

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

Sketch these hyperbolas. Use an x/y-chart in each case.

7)  $xy = -8$

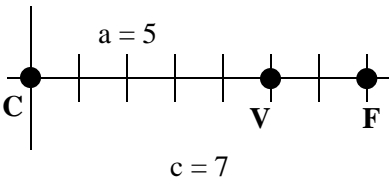
x	y	x	y
2	-4	-2	4
4	-2	-4	2

8)  $xy = 5$

x	y	x	y
1	5	-1	-5
5	1	-5	-1

Find the equation for each hyperbola with center at the origin that satisfies the given conditions.

- 9) Vertex: (5, 0)  
Focus: (7, 0)

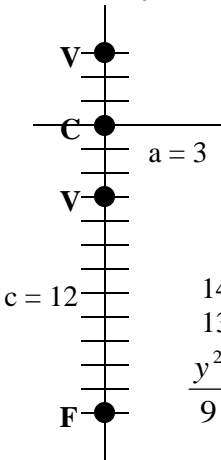


$$49 = 25 + b^2$$

$$24 = b^2$$

$$\frac{x^2}{25} - \frac{y^2}{24} = 1$$

- 10) Focus: (0, -12)  
Major axis: 6 units

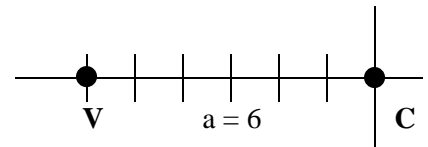


$$144 = 9 + b^2$$

$$135 = b^2$$

$$\frac{y^2}{9} - \frac{x^2}{135} = 1$$

- 11) Vertex: (-6, 0)  
Asymptotes:  $y = \pm 1/2x$



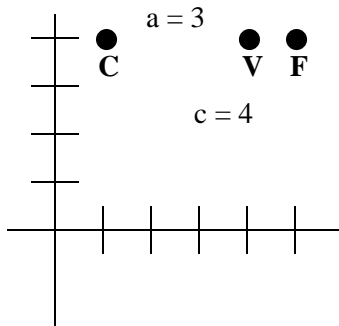
$$\text{asym: } \pm \frac{b}{a} = \pm \frac{b}{6} = \pm \frac{2}{1}$$

$$b = 3$$

$$\frac{x^2}{36} - \frac{y^2}{9} = 1$$

Find the equation for each hyperbola not centered at the origin that satisfies the given conditions.

- 12) Center: (1, 4)  
Vertex: (4, 4)  
Focus: (5, 4)

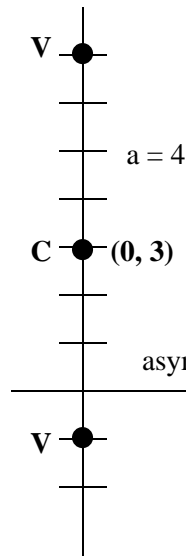


$$16 = 9 + b^2$$

$$7 = b^2$$

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

- 13) Vertices: (0, -1) & (0, 7)  
Asy. slopes:  $\pm 2$



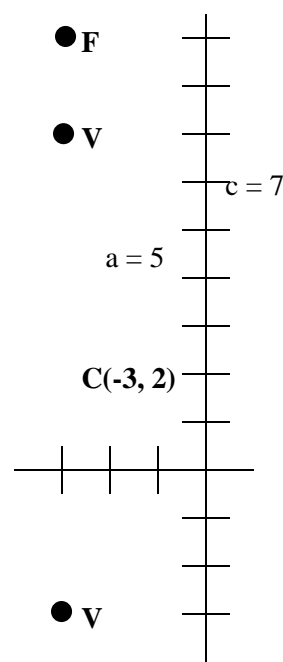
$$\text{asym: } \pm \frac{a}{b}$$

$$= \pm \frac{4}{b} = \pm \frac{2}{1}$$

$$b = 2$$

$$\frac{(y-3)^2}{16} - \frac{x^2}{4} = 1$$

- 14) Vertex: (-3, 7)  
Focus: (-3, 9)  
major axis: 10 units



$$49 = 25 + b^2$$

$$24 = b^2$$

$$\frac{(y-2)^2}{25} - \frac{(x+3)^2}{24} = 1$$

- 15) Be able to identify these parts of a hyperbola: vertex, focus, asymptote, and major axis.