

Name: Key

Period:

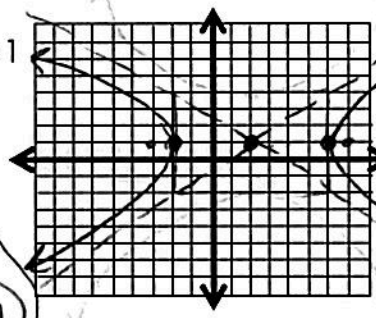
Evaluate: Hyperbolas

Graph each of the following and identify the attributes.

$a=4$
 $b=3$

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

center $(2, 1)$
foci $(-3, 1)$ & $(7, 1)$
vertices $(-2, 1)$ & $(6, 1)$

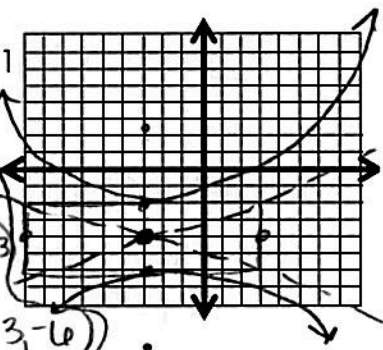


$c^2 = 16 + 9$
 $c^2 = 25 \rightarrow c = 5$

$a=2$
 $b=6$

2. $\frac{(y+4)^2}{4} - \frac{(x+3)^2}{36} = 1$

center $(-3, -4)$
foci $(-3, 2.3)$ & $(-3, -12.3)$
vertices $(-3, -2)$ & $(-3, -6)$



$c^2 = 4 + 36$
 $c^2 = 40 \quad c = \sqrt{40} \approx 6.3$

For 3 - 6, write equation of each hyperbola using the given information.

$h \quad k$

$a=5$

3. Center at $(8, -5)$ with the vertices at $(8, 0)$ and $(8, -10)$ and foci at $(8, -5 \pm \sqrt{30})$ $c = \sqrt{30}$

$\frac{(y+5)^2}{25} - \frac{(x-8)^2}{5} = 1$

$c^2 = a^2 + b^2$
 $30 = 25 + b^2$
 $b^2 = 5$

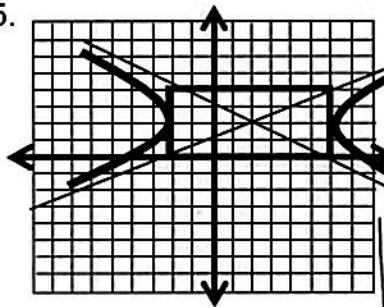
4. Center at $(0,0)$ with the vertices at $(4, 0)$ and $(-4, 0)$ and an asymptote at $y = \frac{3}{2}x$. $\frac{\pm b}{a} = b=6$

$a=4 \quad a^2=16$

$b^2=36$

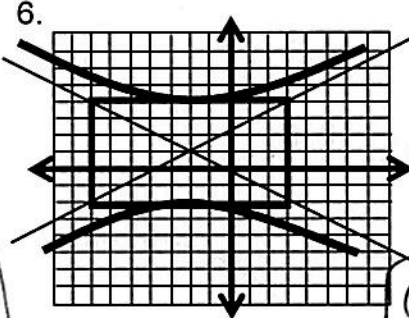
$\frac{x^2}{16} - \frac{y^2}{36} = 1$

5. center $(2, 2)$
 $a=4 \quad a^2=16$
 $b=2 \quad b^2=4$



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

6. center $(-2, 1)$
 $a=3, \quad a^2=9$
 $b=5, \quad b^2=25$



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

7. You are designing a new logo for the gym floor. The pattern is modeled by the equation

$\frac{(y+4)^2}{9} - \frac{(x+3)^2}{36} = 1$

The athletic director loves the design except for one thing. He would

like for the transverse axis to be 6 units tall. Write the new equation of the logo.

a needs to be 3
 $a^2=9$

$\frac{(y+4)^2}{9} - \frac{(x+3)^2}{36} = 1$

Write each of the following in standard form. Graph. Find the center and other important information. Note they are not necessarily all hyperbolas.

hyperbola

8. $4x^2 - 9y^2 + 16x + 108y = 344$ Hyperbola

$$4x^2 + 16x - 9y^2 + 108y = 344$$

$$4\left(x^2 + \frac{4x}{1} + \frac{4}{1}\right) - 9\left(y^2 - \frac{12y}{1} + \frac{36}{1}\right) = 344$$

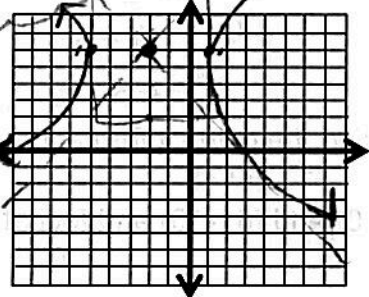
$\begin{matrix} +16 \\ -324 \\ \hline -324 \end{matrix}$

$$\frac{4(x+2)^2}{36} - \frac{9(y-6)^2}{36} = \frac{36}{36}$$

$$\frac{(x+2)^2}{9} - \frac{(y-6)^2}{4} = 1$$

$a=3$
 $b=2$

center $(-2, 6)$
 foci $(-5, 6)$ & $(1, 6)$
 vertices $(-5, 6)$ & $(1, 6)$



$c^2 = 9+4$
 $c = \sqrt{13} \approx 3.6$

9. $x^2 - y^2 - 14x - 8y + 37 = 0$

$$x^2 - 14x - y^2 - 8y = -37$$

$$\left(x^2 - \frac{14x}{1} + \frac{49}{1}\right) - \left(y^2 + \frac{8y}{1} + \frac{16}{1}\right) = -37$$

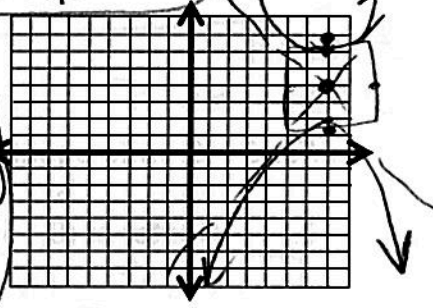
$\begin{matrix} +49 \\ -16 \\ \hline -16 \end{matrix}$

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

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

$a=2$
 $b=2$

center $(7, 4)$
 foci $(7, 6.8)$ & $(7, 1.2)$
 vertices $(7, 2)$ & $(7, 6)$



$c^2 = 4+4$
 $c = \sqrt{8} \approx 2.8$

10. $x^2 + y^2 + 8x - 6y - 56 = 0$ Circle!

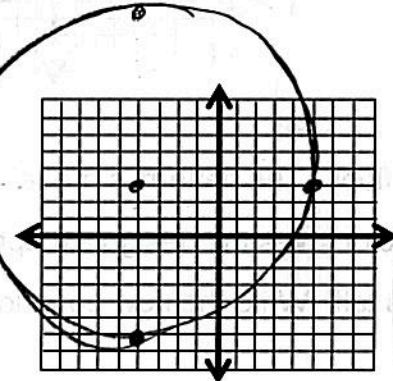
$$x^2 + 8x + y^2 - 6y = 56$$

$$\left(x^2 + \frac{8x}{1} + \frac{16}{1}\right) + \left(y^2 - \frac{6y}{1} + \frac{9}{1}\right) = 56$$

$\begin{matrix} +16 \\ +9 \\ \hline +9 \end{matrix}$

$$(x+4)^2 + (y-3)^2 = 81$$

center $(-4, 3)$
 foci None
 vertices None
 $r = 9$



$c^2 = 5-4$
 $c^2 = 1$
 $c = 1$

11. $5x^2 + 4y^2 - 30x + 24y + 61 = 0$ Ellipse

$$5x^2 - 30x + 4y^2 + 24y = -61$$

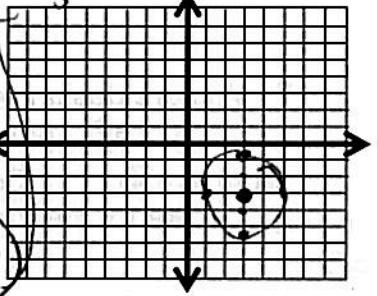
$$5\left(x^2 - \frac{6x}{1} + \frac{9}{1}\right) + 4\left(y^2 + \frac{6y}{1} + \frac{9}{1}\right) = -61$$

$\begin{matrix} +45 \\ +36 \\ \hline +36 \end{matrix}$

$$\frac{5(x-3)^2}{20} + \frac{4(y+3)^2}{20} = \frac{10}{20}$$

$$\frac{(x-3)^2}{4} + \frac{(y+3)^2}{5} = 1$$

center $(3, -3)$
 foci $(3, -2)$ & $(3, -4)$
 vertices $(3, 0.8)$ & $(3, -5.8)$



$b=2$
 $a = \sqrt{5} = 2.2$