

3.3 - Day 5 - Hyperbolas

EXAMPLE 2 Finding the Equation of a Hyperbola from Its Foci and Vertices

Find the standard form of the equation of a hyperbola with foci at $(0, -3)$ and $(0, 3)$ and vertices $(0, -2)$ and $(0, 2)$

transverse
y-axis

$$a=2$$

$$a^2=4$$

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

$$9 = 4 + b^2$$

$$5 = b^2$$

$$c=3$$

$$c^2=9$$

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

HW: p. 945:
#s 6,8,9,30,31
34,37,40,47

✓ Check Point 2 Foci: $(-4, 0)$, $(4, 0)$; vertices: $(-3, 0)$, $(3, 0)$

$$c=4$$

$$c^2=16$$

transverse
x-axis

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

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

$$16 = 9 + b^2$$

$$b^2 = 7$$

$$a=3$$

$$a^2=9$$

Ex. Find the standard form of the equation of a hyperbola with:

End points of the transverse axis: $(-3,0)$, $(3,0)$; asymptote: $y = 2x$

transverse x-axis

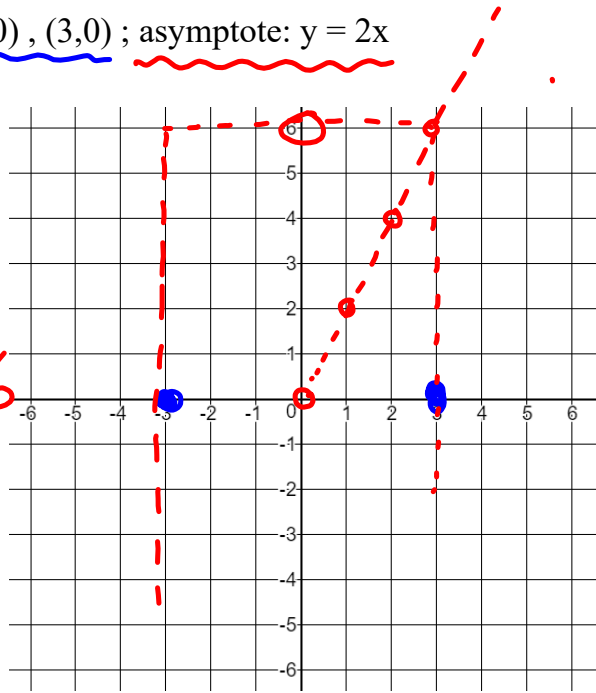
$$\frac{x^2}{9} - \frac{y^2}{36} = 1$$

$$a=3$$

$$a^2=9$$

$$b=6$$

$$b^2=36$$



EXAMPLE 5 Graphing a Hyperbola Centered at (h, k)

Graph: $\frac{(x-2)^2}{16} - \frac{(y-3)^2}{9} = 1$. Where are the foci located? What are the equations of the asymptotes?

center: $(2,3)$

transverse x-axis: $a^2=16$

Asymptote slope: $\frac{3}{4}$

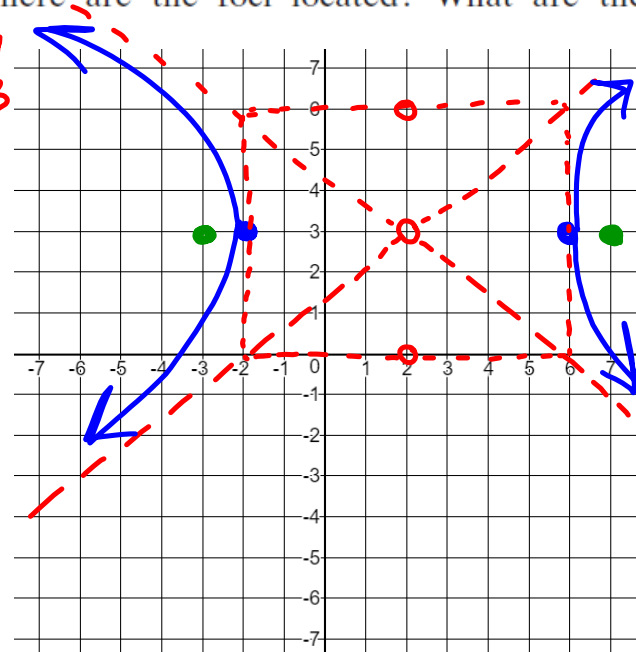
$$a=4$$

$$c^2 = 16 + 9$$

$$c^2 = 25$$

$$c=5$$

Foci: $(-3,3)$
 $(7,3)$



Check Point 5 Graph: $\frac{(y-1)^2}{9} - \frac{(x+3)^2}{4} = 1$ Where are the foci located? What are the equations of the asymptotes?

center: $(-3, 1)$

transverse y-axis $a^2 = 9$
 $a = 3$

$$c^2 = 9 + 4$$

$$c^2 = 13$$

$$c \approx 3.6$$

Foci:
 $(-3, 4.6)$
 $(-3, -2.6)$

$$b^2 = 4$$

$$b = 2$$

Asymptote
Slope
 $\frac{3}{2}$

