

Day 48

## 10.5 Hyperbolas Center (0,0)

①  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$   $\leftarrow \begin{matrix} \uparrow \\ \downarrow \end{matrix}$  major axis: x  
(horizontal transverse axis)

Vertices:  $(\pm a, 0)$   
Foci:  $(\pm c, 0)$  asymptotes:  $y = \pm \frac{b}{a}x$

②  $\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$   $\leftarrow \begin{matrix} \uparrow \\ \downarrow \end{matrix}$  major axis: y  
(vertical transverse axis)

Vertices:  $(0, \pm a)$   
Foci:  $(0, \pm c)$  asymptotes:  $y = \pm \frac{a}{b}x$

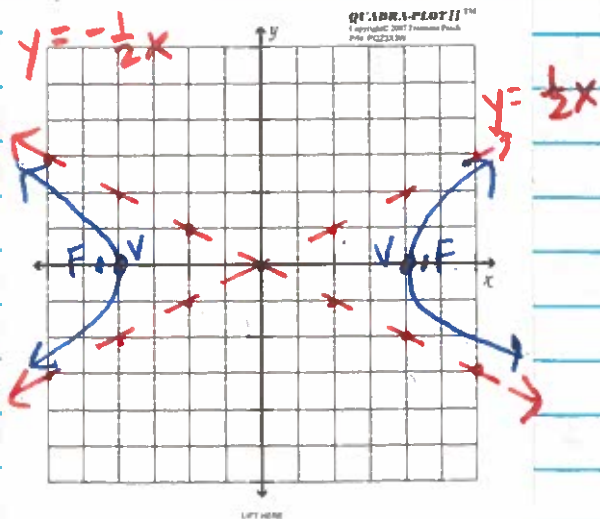
Foci equation:  $c^2 = a^2 + b^2$

ex. ① Graph

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

$a^2 = 16$   $b^2 = 4$   
 $a = 4$   $b = 2$

$$c^2 = 16 + 4$$
$$\sqrt{c^2} = \sqrt{20}$$
$$c = \sqrt{4 \cdot 5}$$
$$c = \pm 2\sqrt{5} \approx 4.5$$



major axis: x

vertices:  $(\pm 4, 0)$

Foci:  $(\pm 2\sqrt{5}, 0)$

asymptotes:  $y = \pm \frac{2}{4}x$   
 $y = \pm \frac{1}{2}x$

ex 2 Graph  $\frac{81y^2}{729} - \frac{9x^2}{729} = \frac{729}{729}$

major axis:  $y$   $\frac{y^2}{81} - \frac{x^2}{81} = 1$   $a=3$   
 vertices:  $(0, \pm 3)$   $b=9$   
 $c=$

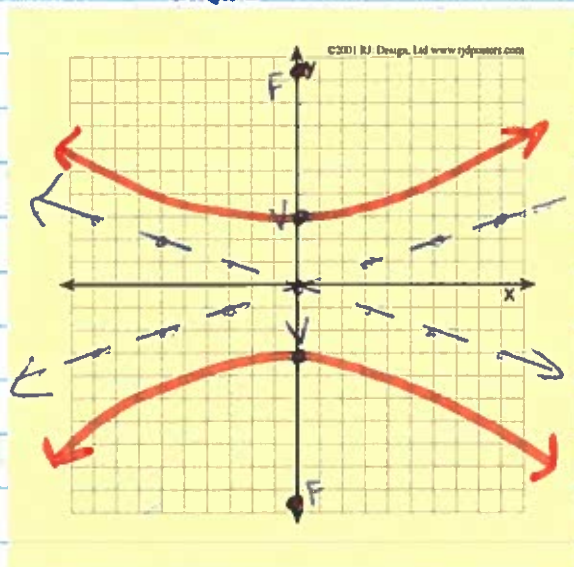
Foci:  $(0, \pm 3\sqrt{10})$

asymptotes:  $y = \pm \frac{3}{9}x$

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

$y = \pm \frac{1}{3}x$

$c^2 = 9 + 81$   
 $\sqrt{c^2} = \sqrt{90}$   
 $c = \sqrt{90}$   
 $3\sqrt{10} \approx 9.5$



ex Find the eq. Assume the transverse axis is horizontal.  $a=263$   $c=407$

$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$  ← major axis:  $x$

$\frac{x^2}{69169} - \frac{y^2}{96480} = 1$

$a^2 \rightarrow$

$c^2 = a^2 + b^2$   
 $407^2 = 263^2 + b^2$   
 $165649 = 69169 + b^2$   
 $-69169 \quad -69169$   
 $96480 = b^2$

Find the eq.

(ex) Foci  $(0, \pm 2)$  vertices  $(0, \pm 1)$   $\swarrow a=1$

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

$$c=2, a=1$$

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

$$2^2 = 1^2 + b^2$$

$$4 = 1 + b^2$$

$$3 = b^2$$

$$\boxed{\frac{y^2}{1} - \frac{x^2}{3} = 1}$$

Graph 2-12 Even

20-26 Even