

Name: _____
PC: Conic Sections

Date: _____

Do Now:

Ms. Loughran

1. Given $\frac{5(x+1)^2}{15} + \frac{y^2}{15} = 15$. Find each of the following.

Center:

$$(-1, 0)$$

Major axis length:

$$2\sqrt{5}$$

Minor axis length:

$$2\sqrt{3}$$

Vertices:

$$(-1, 0 \pm \sqrt{5}) \rightarrow (-1, \pm\sqrt{5})$$

Covertices:

$$(-1 \pm \sqrt{3}, 0)$$

Foci:

$$(-1, \pm\sqrt{2})$$

$$\frac{(x+1)^2}{3} + \frac{y^2}{5} = 1 \quad \text{VMA}$$

$$\begin{aligned} a^2 &= 5, a = \sqrt{5} \uparrow \downarrow \\ b^2 &= 3, b = \sqrt{3} \uparrow \downarrow \\ c^2 &= 5 - 3 = 2 \\ c &= \sqrt{2} \uparrow \downarrow \end{aligned}$$

2. Given $\frac{(y+1)^2}{49} - \frac{(x-3)^2}{25} = 1$. Find each of the following.

Center:

$$(3, -1)$$

Vertices:

$$(3, -1 \pm 7) \left\{ \begin{array}{l} (3, -8) \\ (3, -6) \end{array} \right.$$

Foci:

$$(3, -1 \pm \sqrt{74})$$

Asymptotes:

$$y - k = \pm \frac{a}{b} (x - h)$$

$$y - (-1) = \pm \frac{7}{5} (x - 3)$$

$$y + 1 = \pm \frac{7}{5} (x - 3)$$

$y = k \pm$
VTA

$$\begin{aligned} a^2 &= 49, a = 7 \uparrow \downarrow \\ b^2 &= 25, b = 5 \\ c^2 &= a^2 + b^2 \\ c^2 &= 49 + 25 \\ c^2 &= 74 \\ c &= \sqrt{74} \uparrow \downarrow \end{aligned}$$

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Continuing from yesterday...

4. Find the coordinates of the center, foci, and vertices, and the equations of the asymptotes of the graph of $\frac{(x-5)^2}{25} - \frac{(y+1)^2}{9} = 1$. Then graph the hyperbola.

HTA

$$a^2 = 25, a = 5 \Leftrightarrow$$

$$b^2 = 9, b = 3$$

$$c^2 = 25 + 9$$

$$c^2 = 34$$

$$c = \sqrt{34} \Leftrightarrow$$

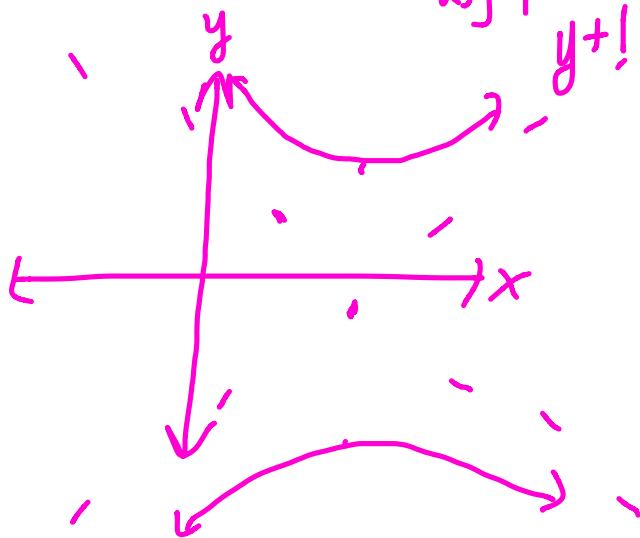
$$\text{Center: } (5, -1)$$

$$\text{vertices: } (5 \pm 5, -1) \begin{cases} (10, -1) \\ (0, -1) \end{cases}$$

$$\text{foci: } (5 \pm \sqrt{34}, -1)$$

Asympt:

$$y + 1 = \pm \frac{3}{5}(x - 5)$$



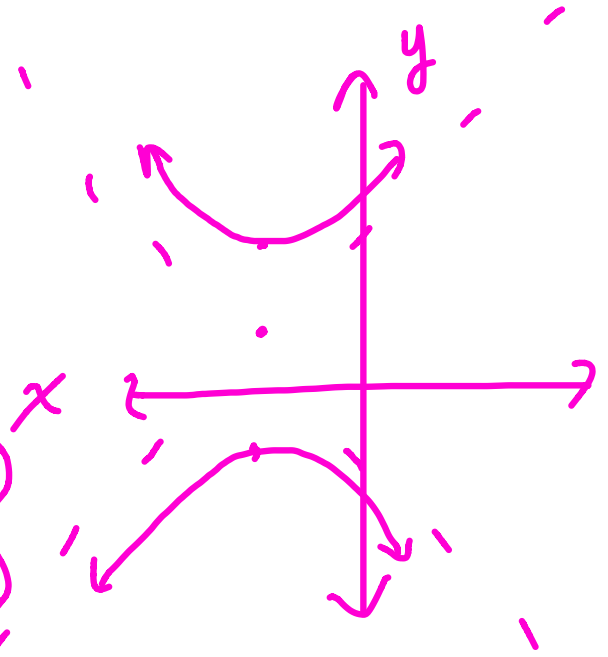
5. Find the coordinates of the center, foci, and vertices, and the equations of the asymptotes of the graph of $25y^2 - 9x^2 - 100y - 72x - 269 = 0$. Then graph the hyperbola.

$$25y^2 - 100y - 9x^2 - 72x = 269$$

$$25(y^2 - 4y + 4) - 9(x^2 + 8x + 16) = 269 + 4(25) - 9(16)$$

$$\frac{25(y-2)^2}{25} - \frac{9(x+4)^2}{25} = \frac{225}{25}$$

$$\frac{(y-2)^2}{9} - \frac{(x+4)^2}{25} = 1$$



VTA (opens up and down)

$$a^2 = 9, a = 3 \uparrow \downarrow$$

$$b^2 = 25, b = 5$$

$$c^2 = 9 + 25 = 34$$

$$c = \sqrt{34} \uparrow \downarrow$$

Center: $(-4, 2)$

vertices: $(-4, 2 \pm 3)$ $\left\{ \begin{array}{l} (-4, 5) \\ (-4, -1) \end{array} \right.$

foci: $(-4, 2 \pm \sqrt{34})$

asym: $y - 2 = \pm \frac{3}{5}(x + 4)$

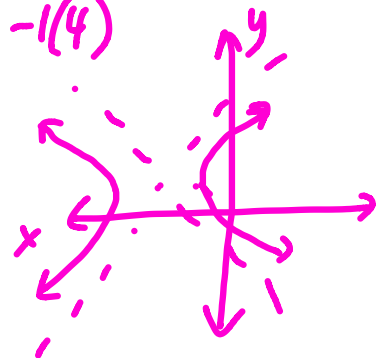
6. Find the coordinates of the center, foci, and vertices, and the equations of the asymptotes of the graph of $4x^2 - y^2 + 24x + 4y + 28 = 0$. Then graph the hyperbola.

$$4x^2 + 24x - y^2 + 4y = -28$$

$$4(x^2 + 6x + 9) - (y^2 - 4y + 4) = -28 + 4(9) - 1(4)$$

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

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



HTA (opens left and right)

$$a^2 = 1, a = 1 \leftarrow \rightarrow$$

$$b^2 = 4, b = 2$$

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

$$c = \sqrt{5} \leftarrow \rightarrow$$

Center: $(-3, 2)$ $\left\{ \begin{array}{l} (-4, 2) \\ (-2, 2) \end{array} \right.$

vertices: $(-3 \pm 1, 2)$

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

asym: $y - 2 = \pm \frac{2}{1}(x + 3)$

Homework 03-22 / Classwork 03-23

Identify the vertices, foci, and direction of opening of each.

$$1) \frac{x^2}{81} - \frac{y^2}{4} = 1$$

Vertices: $(9, 0), (-9, 0)$
Foci: $(\sqrt{85}, 0), (-\sqrt{85}, 0)$
Opens left/right

$$2) \frac{x^2}{121} - \frac{y^2}{81} = 1$$

Vertices: $(11, 0), (-11, 0)$
Foci: $(\sqrt{202}, 0), (-\sqrt{202}, 0)$
Opens left/right

$$3) \frac{y^2}{25} - \frac{x^2}{16} = 1$$

Vertices: $(0, 5), (0, -5)$
Foci: $(0, \sqrt{41}), (0, -\sqrt{41})$
Opens up/down

$$4) \frac{x^2}{121} - \frac{y^2}{36} = 1$$

Vertices: $(11, 0), (-11, 0)$
Foci: $(\sqrt{157}, 0), (-\sqrt{157}, 0)$
Opens left/right

$$5) \frac{(x+2)^2}{169} - \frac{(y+8)^2}{4} = 1$$

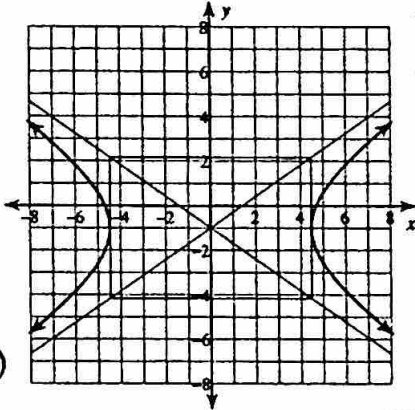
Vertices: $(11, -8), (-15, -8)$
Foci: $(-2 + \sqrt{173}, -8), (-2 - \sqrt{173}, -8)$
Opens left/right

$$6) \frac{(y+8)^2}{36} - \frac{(x+2)^2}{25} = 1$$

Vertices: $(-2, -2), (-2, -14)$
Foci: $(-2, -8 + \sqrt{61}), (-2, -8 - \sqrt{61})$
Opens up/down

Identify the vertices and foci of each. Then sketch the graph.

7) $\frac{x^2}{20} - \frac{(y+1)^2}{10} = 1$



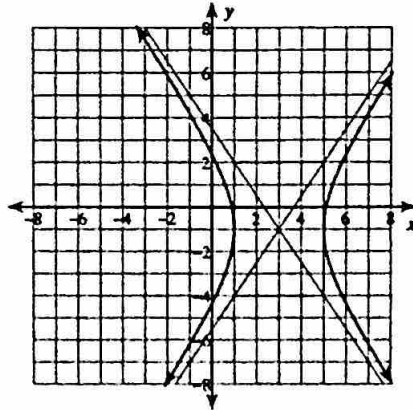
Vertices: $(2\sqrt{5}, -1)$
 $(-2\sqrt{5}, -1)$
 Foci: $(\sqrt{30}, -1)$
 $(-\sqrt{30}, -1)$

$C: (0, -1)$

$a = \sqrt{20}$ $b = \sqrt{10}$

$y + 1 = \pm \frac{\sqrt{10}}{\sqrt{20}} (x - 0)$

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



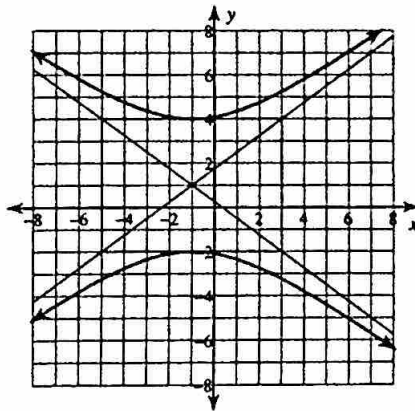
Vertices: $(5, -1)$
 $(1, -1)$
 Foci: $(3 + \sqrt{13}, -1)$
 $(3 - \sqrt{13}, -1)$

$C: (3, -1)$

$a = 2$
 $b = 3$

$y + 1 = \pm \frac{3}{2} (x - 3)$

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



Vertices: $(-1, 4)$
 $(-1, -2)$
 Foci: $(-1, 6)$
 $(-1, -4)$

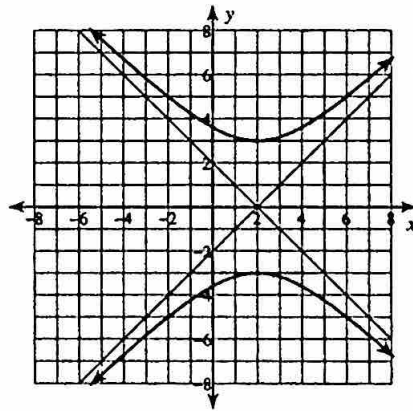
$C: (-1, 1)$

$a = 3$

$b = 4$

$y - 1 = \pm \frac{3}{4} (x + 1)$

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

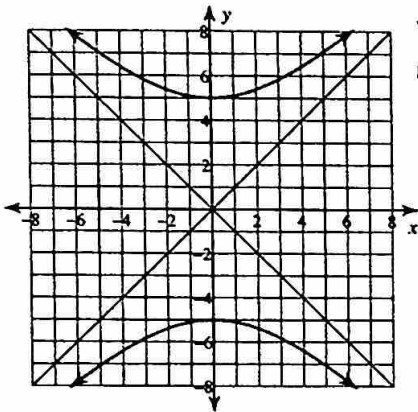


Vertices: $(2, 3)$
 $(2, -3)$
 Foci: $(2, 3\sqrt{2})$
 $(2, -3\sqrt{2})$

$C: (2, 0)$
 $a = 3, b = 3$

$y = \pm 1 (x - 2)$

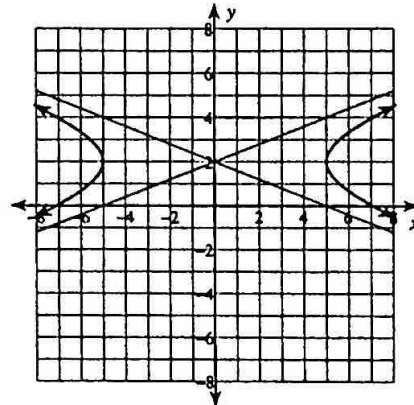
$$11) \frac{y^2}{25} - \frac{x^2}{25} = 1$$



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

$$y-0 = \pm 1(x-0)$$

$$12) \frac{x^2}{25} - \frac{(y-2)^2}{4} = 1$$



Vertices: (5, 2)
(-5, 2)
Foci: ($\sqrt{29}$, 2)
($-\sqrt{29}$, 2)

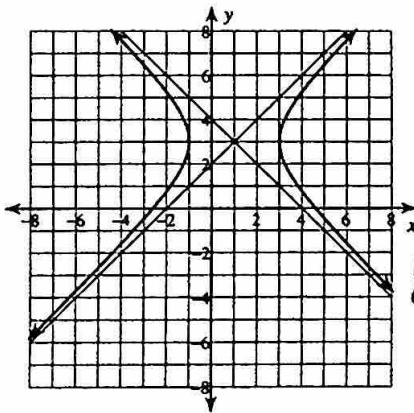
$$a = 5$$

$$b = 2$$

$$C: (0, 2)$$

$$y-2 = \pm \frac{2}{5}(x-0)$$

$$13) \frac{(x-1)^2}{4} - \frac{(y-3)^2}{4} = 1$$

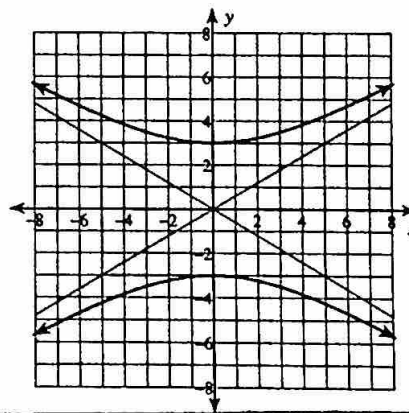


Vertices: (3, 3)
(-1, 3)
Foci: ($1 + 2\sqrt{2}$, 3)
($1 - 2\sqrt{2}$, 3)

$$(1, 3)$$

$$y-3 = \pm 1(x-1)$$

$$14) \frac{y^2}{9} - \frac{x^2}{25} = 1$$



Vertices: (0, 3)
(0, -3)
Foci: (0, $\sqrt{34}$)
(0, $-\sqrt{34}$)

$$a = 3, b = 5$$

$$y-0 = \pm \frac{3}{5}(x-0)$$