Name: ____________________________________ Date: ________

PCH: More Hyperbolas

Do Now:

Sketch the graph of each hyperbola. Plot and label the center, vertices, foci and asymptotes. State the length of the transverse axis.

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

center: (0,0)

HTA (x term+)

$a = 5$ ⇄

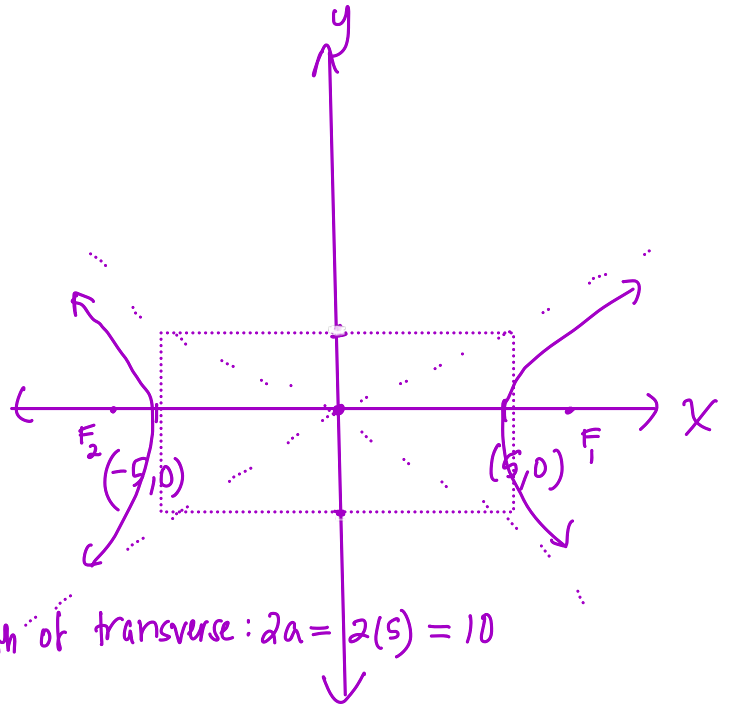
$b = 3$

$c = \sqrt{34}$ ⇄

vertices: $(\pm 5, 0)$

foci: $(\pm\sqrt{34}, 0)$

asym: $y = \pm \frac{3}{5}x$



length of transverse: $2a = 2(5) = 10$

2. $\frac{(x+2)^2}{25} - \frac{(y-4)^2}{16} = 1$

center: (-2,4)

HTA

$a = 5$ ⇄

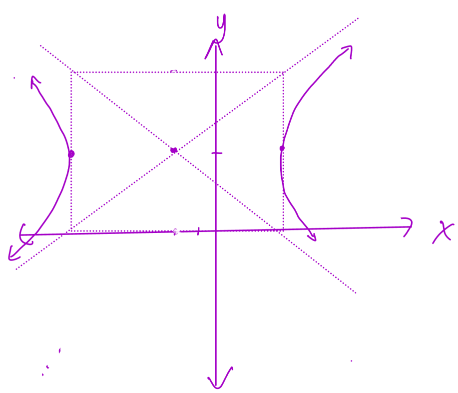
$b = 4$

$c = \sqrt{41}$ ⇄

vertices: $(-2 \pm 5, 4)$ < (3,4), (-7,4)

foci: $(-2 \pm \sqrt{41}, 4)$

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



length of transverse axis = 10

3. $\frac{(y-1)^2}{4} - \frac{x^2}{100} = 1$

center: (0,1)

VTA

$a = 2$ ↑↓

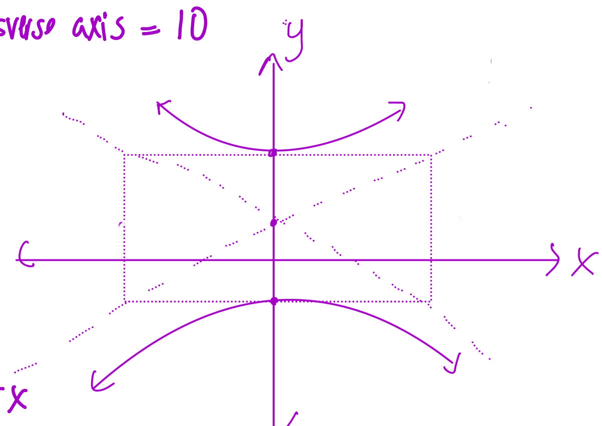
$b = 10$

$c = \sqrt{104}$ ↑↓

vertices: $(0, 1 \pm 2)$ < (0,-1), (0,3)

foci: $(0, 1 \pm \sqrt{104})$

asym: $y - 1 = \pm \frac{1}{5}x$



length of transverse axis = 4

Wrapping up 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.

center: $(5,-1)$

HTA

$a=5 \rightleftarrows$

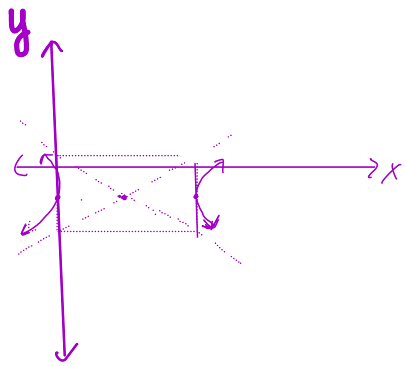
$b=3$

$c=\sqrt{34} \rightleftarrows$

Vertices: $(0,-1)$, $(10,-1)$

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

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



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.

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

$4(x^2+6x+9)-(y^2-4y+4)=-28+36-4$

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

center: $(-3,2)$

HTA

$a=1 \rightleftarrows$

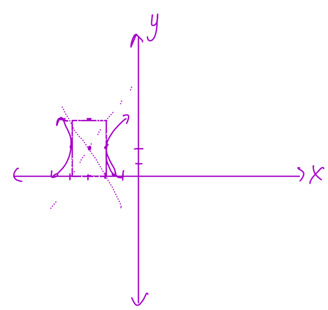
$b=2$

$c=\sqrt{5} \rightleftarrows$

vertices: $(-3\pm1,2)$

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

asympt: $y-2=\pm2(x+3)$



4. $9x^2 + 36x - y^2 + 10y + 2 = 0$

5. $4x^2 - 5y^2 + 40x - 30y - 45 = 0$

6. $x^2 - 4y^2 - 2x + 16y = 20$

Write, in standard form, the equation of the hyperbola, having the given properties.

(h,k) $c=6$ $a=4$ HTA

7. Center (0, 0); foci $(\pm 6, 0)$; vertices $(\pm 4, 0)$

x term is ⊕

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

$36 = 16 + b^2$

$20 = b^2$

$$\frac{x^2}{16} - \frac{y^2}{20} = 1$$

8. Center (0, 0); foci $(0,\pm 4)$; vertices $(0,\pm 1)$

(h,k) HTA x term $+$

9. Center $(3,-1)$; foci $(-2,-1)$ and $(8,-1)$; vertices $(0,-1)$ and $(6,-1)$

$c = 8-3$ or $3-(-2) = 5$

$a = 6-3$ or $3-0 = 3$

$25 = 9 + b^2$

$16 = b^2$

$$\frac{(x-3)^2}{9} - \frac{(y+1)^2}{16} = 1$$

10. Asymptotes $y = \pm\frac{5}{12}x$; foci $(\pm 13, 0)$

11. Asymptotes $y = \pm\frac{8}{15}x$; foci $(0,\pm 17)$

a

b

center: (0,0)

VTA

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

$$\frac{y^2}{64} - \frac{x^2}{225} = 1$$

Homework 03-04

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

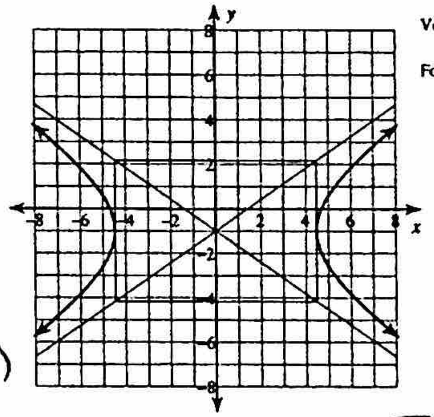
Vertices: $(11, -8), (-15, -8)$
Foci: $(-2 + \sqrt{173}, -8), (-2 - \sqrt{173}, -8)$
Opens left/right

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



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

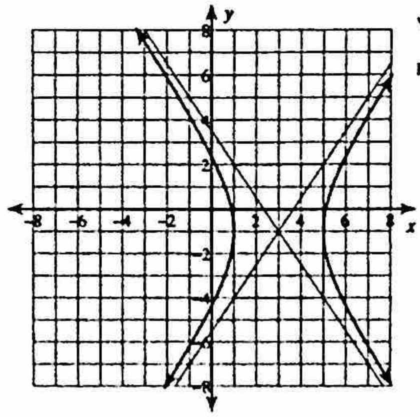
c: (0, -1)

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

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

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

C: (3, -1)

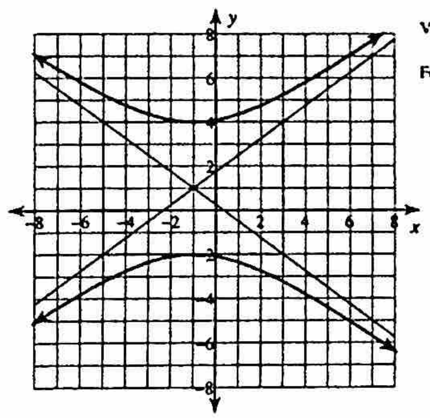


Vertices: $(5, -1)$
$(1, -1)$
Foci: $(3 + \sqrt{13}, -1)$
$(3 - \sqrt{13}, -1)$

$a = 2$
$B = 3$

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

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



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

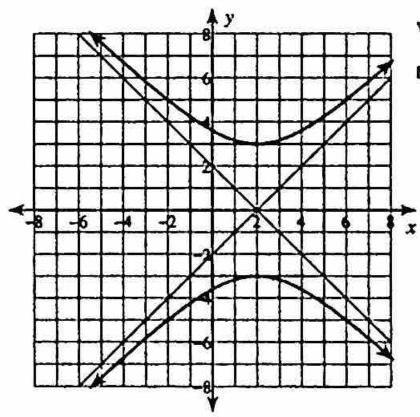
c: (-1, 1)

$a = 3$

$b = 4$

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

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

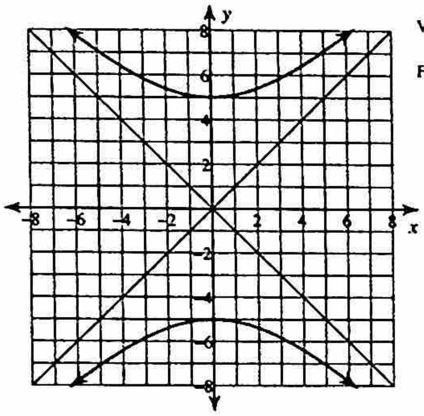


Vertices: $(2, 3)$
$(2, -3)$
Foci: $(2, 3\sqrt{2})$
$(2, -3\sqrt{2})$

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

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

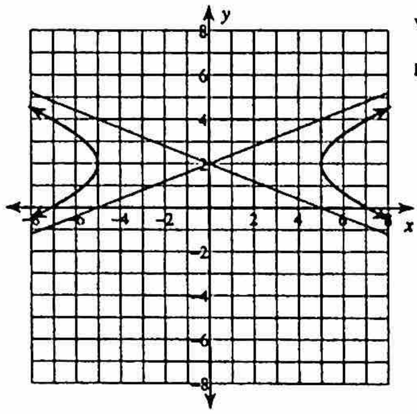
11) $\frac{y^2}{25} - \frac{x^2}{25} = 1$



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

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

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



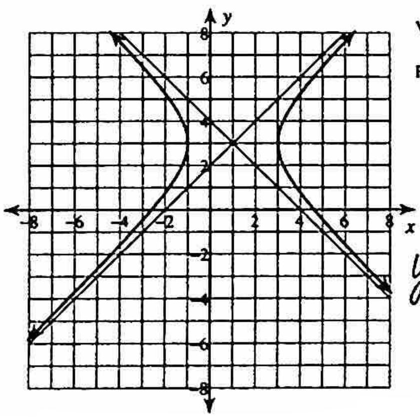
Vertices: $(5, 2)$
$(-5, 2)$
Foci: $(\sqrt{29}, 2)$
$(-\sqrt{29}, 2)$

$a = 5$
$b = 2$

$C: (0, 2)$

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

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

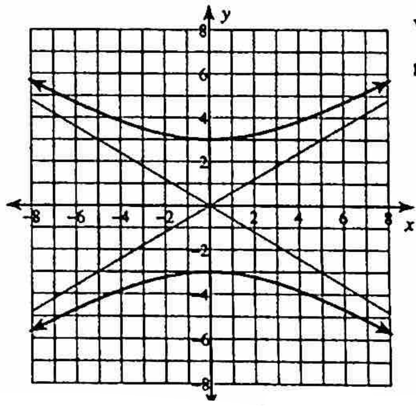


Vertices: $(3, 3)$
$(-1, 3)$
Foci: $(1 + 2\sqrt{2}, 3)$
$(1 - 2\sqrt{2}, 3)$

$(1, 3)$

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

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



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

$a = 3,\ b = 5$

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