Do Now For #1-3 : sketch the graphs
And fill out the information on the lines below each.
When applicable, write NONE

① $4x^2 - 200y + 16x + 25y^2 + 316 = 0$

$$4x^2 + 16x + 25y^2 - 200y = -316$$

$$4(x^2 + 4x + 4) + 25(y^2 - 8y + 16) = -316 + 16 + 400$$

$$4(x+2)^2 + 25(y-4)^2 = 100$$

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

HMA

$a = 5$ ⇄

$b = 2$ ↑↓

$c = \sqrt{21}$ ⇄

Type of conic: ellipse

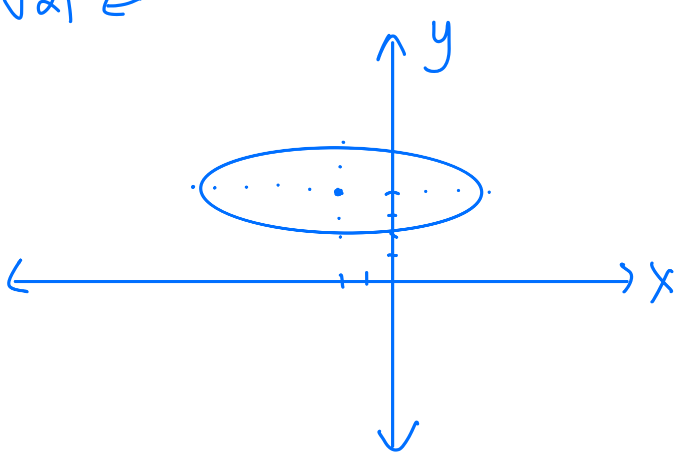
Coordinates of center: $(-2, 4)$

Coordinates of vertices: $(-2 \pm 5, 4)$ → $(-7, 4)$, $(3, 4)$

Coordinates of covertices: $(-2, 4 \pm 2)$ → $(-2, 2)$, $(-2, 6)$

Coordinates of foci: $(-2 \pm \sqrt{21}, 4)$

Equations of asymptotes: none

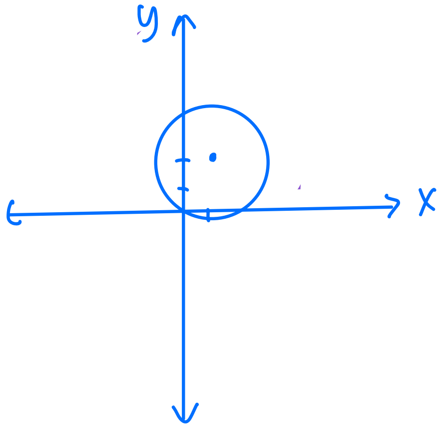


(2) $2x^2 + 2y^2 - 4x - 8y - 1 = 0$

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

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

$(x-1)^2 + (y-2)^2 = \frac{11}{2}$ $r = \sqrt{\frac{11}{2}}$



Type of conic: circle

Coordinates of center: (1,2)

Coordinates of vertices: none

Coordinates of covertices: none

Coordinates of foci: none

Equations of asymptotes: none

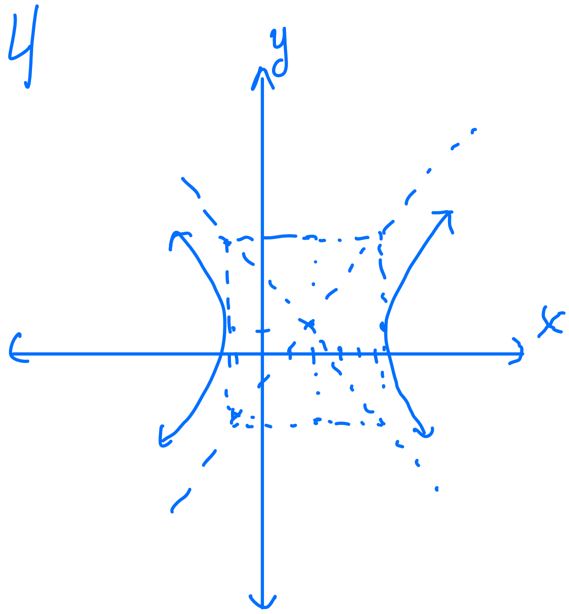
③ $16x^2 - 9y^2 - 64x + 18y - 89 = 0$

$16x^2 - 64x \quad -9y^2 + 18y \quad = 89$

$16(x^2 - 4x + 4) - 9(y^2 - 2y + 1) = 89 + 64 - 9$

$16(x-2)^2 - 9(y-1)^2 = 144$

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



HTA

$a = 3 \rightleftarrows$

$b = 4$

$c = 5 \rightleftarrows$

Type of conic: hyperbola

Coordinates of center: $(2,1)$

Coordinates of vertices: $(2 \pm 3, 1)$ < $(-1,1)$, $(5,1)$

Coordinates of covertices: none

Coordinates of foci: $(2 \pm 5, 1)$ < $(-3,1)$, $(7,1)$

Equations of asymptotes:

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

④ Write the equation of the circle that passes through the points (-18,-5), (-7,-16) and (4,-5), given the x-coordinate of the center is -7.

↳ $h=-7$

$$(-18+7)^2+(-5-k)^2=(\cancel{-7+7})^2+(-16-k)^2$$

$$121+\cancel{k^2}+10k+25=\cancel{k^2}+32k+256$$

146

$$-22k=110$$

$$k=-5$$

center: $(-7,-5)$

$$(x+7)^2+(y+5)^2=r^2$$

plugin (-7,-16)

$$(\cancel{-7+7})^2+(-16+5)^2=r^2$$

$$121=r^2$$

$$(x+7)^2+(y+5)^2=121$$

⑤ Write equation of hyperbola given:

asymptotes: $y = -\frac{5}{4}x + 1$ and $y = \frac{5}{4}x - 9$

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

center: $(4, -4)$

VTA

y ⊕

"yab"

$\pm \frac{a}{b} = \pm \frac{5}{4}$

$a = 5$
$b = 4$

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

⑥ Write the eq. of ellipse with:

foci: $(\pm 2, 7)$

major axis of length 6

center: $(0, 7)$

$c = 2$

HMA

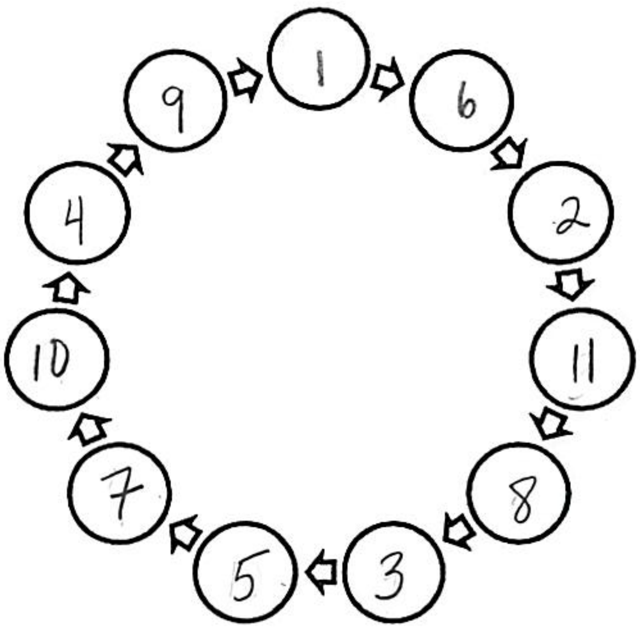
$2a = 6$
$a = 3$

$c^2 = a^2 - b^2$
$4 = 9 - b^2$
$5 = b^2$

$$\frac{x^2}{9} + \frac{(y-7)^2}{5} = 1$$

Ellipses Stations Maze Name ____________________

Show your work in the boxes provided. Keep track of the order that you visit the stations by using the wheel below.



Station 1

$\frac{x^2}{81}+\frac{y^2}{49}=1$

HMA $a=9$ ⇄ C: (0,0)

vertices: $(\pm 9, 0)$

S6

Station 2

$\frac{x^2}{16}+\frac{y^2}{25}=1$

VMA C: (0,0)

$a=5$ ↑↓

$b=4$

$c^2=25-16$

$c=3$ ↑↓

F: $(0,\pm 3)$

S11

Station 3

$18x^2+36y^2=648$

$\frac{x^2}{36}+\frac{y^2}{18}=1$

C: (0,0)

HMA

$a=6$ ⇄

$b=\sqrt{18}$ ↑↓

S5

Station 4

C: (1,-2)

VMA

a^2 under y term

$\frac{(y+2)^2}{9}+\frac{(x-1)^2}{4}=1$ S9

Station 5

C: (0,0)

V: (-5,0) $a=5$

CV: (0,4) $b=4$

$\frac{x^2}{25}+\frac{y^2}{16}=1$

S7

Station 6 $1(x^2+8x+16)+7(y^2-8y+16) = -148+64+112$ $4(x+4)^2+7(y-4)^2=28$ center: $(-4,4)$ S2	Station 7 C: $(0,0)$ VMA $a=4$ $b=2$ $\frac{x^2}{4}+\frac{y^2}{16}=1$ S10	Station 8 HMA $2a=72,\ a=36$ $2b=66,\ b=33$ $\frac{x^2}{36^2}+\frac{y^2}{33^2}=1$ $\frac{x^2}{1296}+\frac{y^2}{1089}=1$ S3
Station 9 VMA V: $(-1,5),(-1,-3)$ $a=4$ CV: $(-4,1),(2,1)$ $b=3$ center: $(-1,1)$ $\frac{(x+1)^2}{9}+\frac{(y-1)^2}{16}=1$	Station 10 VMA F: $(0,5)$ $c=5$ $a=11$ $c^2=a^2-b^2$ $25=121-b^2$ $-96=-b^2$ $96=b^2$ $\sqrt{96}=b$ S4 $\frac{x^2}{96}+\frac{y^2}{121}=1$	Station 11 $4(x^2-2x+1)+9(y^2) = 140+4$ $4(x-1)^2+9y^2=144$ $\frac{(x-1)^2}{36}+\frac{y^2}{16}=1$ HMA c $(1,0)$ $c^2=36-16=20$ $c=\sqrt{20}$ Foci $(1\pm2\sqrt{5},0)$ S8

Start

A

Write an equation for the hyperbola in standard form with vertices $(-7,0)$ and $(7,0)$, and a conjugate axis of length 10 units. $C:(0,0)$

HTA $a=7$

$2b=10$
$b=5$

$$\frac{x^2}{49}-\frac{y^2}{25}=1$$

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

D

Write the equation of the hyperbola in standard form.

$4x^2-24x-25y^2+250y-489=0$

$4(x^2-6x+9)-25(y^2-10y+25)=489+36-625$

$4(x-3)^2-25(y-5)^2=-100$

$$\frac{(x-3)^2}{-25}+\frac{(y-5)^2}{4}=1$$

$$\frac{x^2}{49}-\frac{y^2}{25}=1$$

B

Write the equation of a hyperbola in standard form with center $(2,3)$, a vertex $(0,3)$, and a focus $(5,3)$.

HTA
$a=2$
$c=3$

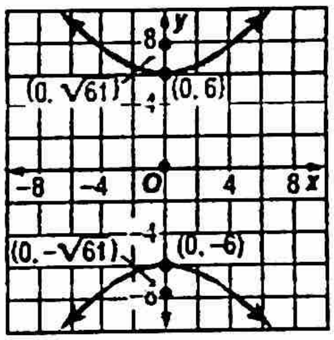
$c^2=a^2+b^2$
$9=4+b^2$
$5=b^2$

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

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

E

Write the equation of the hyperbola in standard form.



VTA y^{+} $c:(0,0)$
$a=6$

$c=\sqrt{61}$

$61=36+b^2$
$25=b^2$
$5=b$

$$\frac{y^2}{36}-\frac{x^2}{25}=1$$

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

C

Write the equation of a hyperbola in standard form with vertices $(4,3)$ and $(4,-5)$, and a conjugate axis of length 4.

VTA
$a=4$
$c:(4,-1)$

$2b=4$
$b=2$

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

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

F

Write the equation of the hyperbola in standard form.

$x^2-6y^2=54$

$$\frac{x^2}{54}-\frac{y^2}{9}=1$$

$$\frac{x^2}{64}-\frac{y^2}{4}=1$$

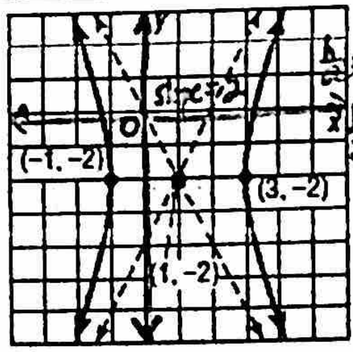
G

End

$$\frac{x^2}{54}-\frac{y^2}{9}=1$$

J

Write the equation of hyperbola in standard form.



HTA x(+)

C: (0,-2)

a=2

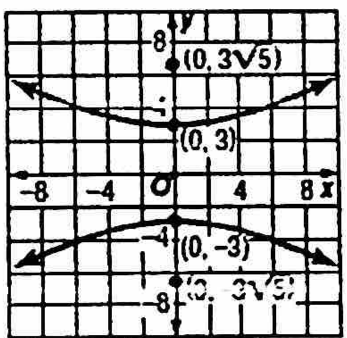
b=4

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

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

H

Write the equation of hyperbola in standard form. C: (0,0)



a=3

$c=3\sqrt{5}$

$(3\sqrt{5})^2=3^2+b^2$

$45=9+b^2$

$36=b^2$

b=6

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

$$\frac{y^2}{36}-\frac{x^2}{25}=1$$

K

Write the equation for the hyperbola in standard form with vertices $(-8,0)$ and $(8,0)$ and equations of asympototes $y=\pm\frac{1}{4}x$

C: (0,0) a=8

HTA

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

$\frac{1}{4}=\frac{b}{8}$ $\quad \frac{x^2}{64}-\frac{y^2}{4}=1$

4b=8

b=2

$$\frac{(y-5)^2}{4}-\frac{(x-3)^2}{25}=1$$

I

Write the equation of the hyperbola in standard form.

$49x^2-7y^2-49=0$

$49x^2-7y^2=49$

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

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

L

Write an equation for the hyperbola in standard form with vertices at $(1,1)$ and $(1,-3)$ and foci $(1,-1\pm\sqrt{5})$.

VTA

a=2

C: (1,-1)

$c=\sqrt{5}$

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

$5=4+b^2$

$1=b^2$

b=1

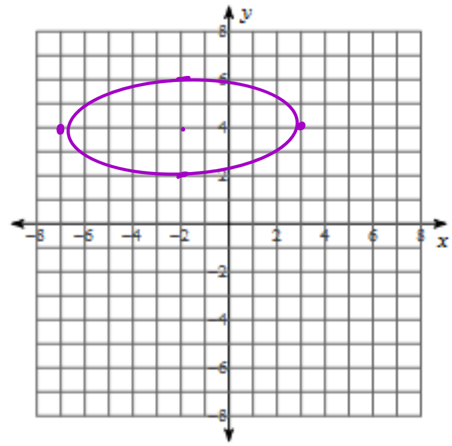
$$\frac{(y+1)^2}{4}-(x-1)^2=1$$

$A \rightarrow B \rightarrow L \rightarrow C \rightarrow H \rightarrow D \rightarrow I \rightarrow F \rightarrow J \rightarrow E \rightarrow K \rightarrow G$

Conic Sections Review Worksheet 1

1. Find the required information and graph the conic section:

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

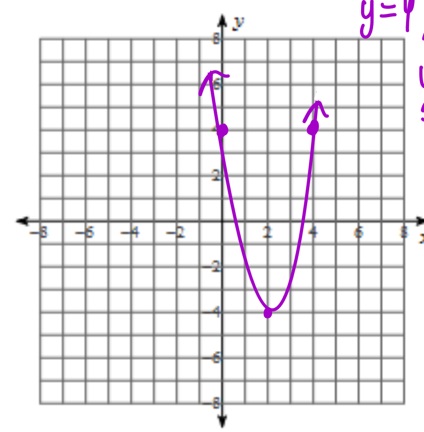


$a = 5$ HMA $\rightleftarrows$ $b = 2$ $c = \sqrt{21}$

Classify the conic section: ellipse **Center:** $(-2, 4)$

Vertices: $(-7, 4)$, $(3, 4)$ **Foci:** $(-2 \pm \sqrt{21}, 4)$

2. Find the required information and graph the conic section: $y = 2x^2 - 8x + 4$



plug in an x-value when $x = 0$ $y = 4$, use symmetry to get third point

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

$y = 2(x-2)^2 + 2(-2)$

$y = 2(x-2)^2 - 4$

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

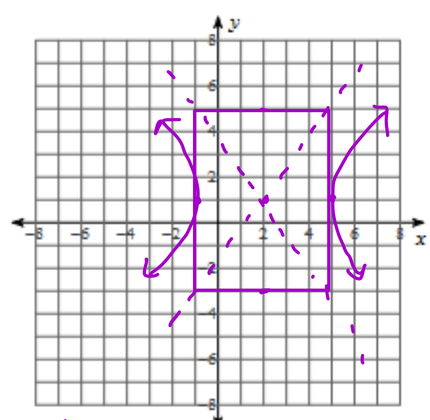
$2 = \frac{1}{4p}$, $1 = 8p$, $p = \frac{1}{8}$

Classify the conic section: parabola **Vertex:** $(2, -4)$

Focus: $(2, -4 + \frac{1}{8})$ $(2, -31/8)$ **Directrix:** $y = -4 - \frac{1}{8} = -\frac{33}{8}$

3. Find the required information. Then graph the conic section.

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



center: $(2, 1)$

$a = 3$ $\rightleftarrows$

$b = 4$

$c = 5$ $\rightleftarrows$

Classify the conic section: hyperbola **Foci:** $(-3, 1)$, $(7, 1)$

Vertices: $(-1, 1)$, $(5, 1)$ **Asymptotes:** $y - 1 = \pm\frac{4}{3}(x-2)$ **Center:** $(2, 1)$

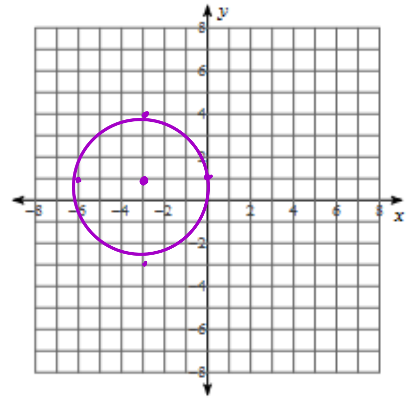
4. Find the equation of the circle that is tangent to the line x = 8 that has a center at (-5, 10).

$r = 8 - (-5)$

$(x+5)^2 + (y-10)^2 = 13^2$

$(x+5)^2 + (y-10)^2 = 169$

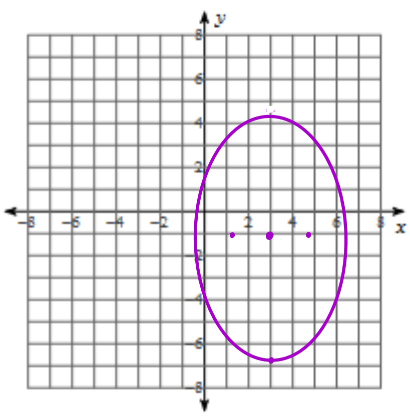
5. Find the required information and graph: $(x+3)^2+(y-1)^2=9$



Classify the conic section: circle **Center:** (-3,1) **Radius:** 3

6. Write the equation of the parabola in vertex form that has a the following information:
Vertex: (2, -8) **Directrix:** $x = 3$

7. Find the required information and graph: $7x^2+3y^2-42x+6y-39=0$



$7(x^2-6x+9)+3(y^2+2y+1)=39+63+3$

$7(x-3)^2+3(y+1)^2=105$

$\frac{(x-3)^2}{15}+\frac{(y+1)^2}{35}=1$

VMA

$a=\sqrt{15}$

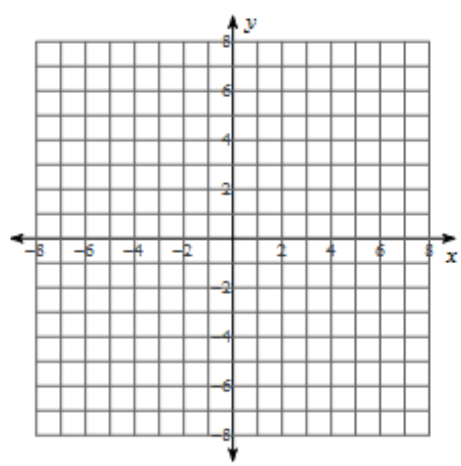
$b=\sqrt{7}$

$c=\sqrt{20}$

Classify the conic section: ellipse **Center:** (3,-1)

Vertices: $(3,-1\pm\sqrt{35})$ **Foci:** $(3,-1\pm 2\sqrt{5})$

8. Find the required information and graph the conic section:
parabola
$4y^2+x-32y+68=0$



Classify the conic section: ______________ **Vertex:** ______________

Focus: ______________ **Directrix:** ______________

$r=12-(-2)$

9. Find the equation of the circle that is tangent to equation y = (-2) that has a center at (-6, 12).

$(x+6)^2+(y-12)^2=14^2$

$(x+6)^2+(y-12)^2=196$

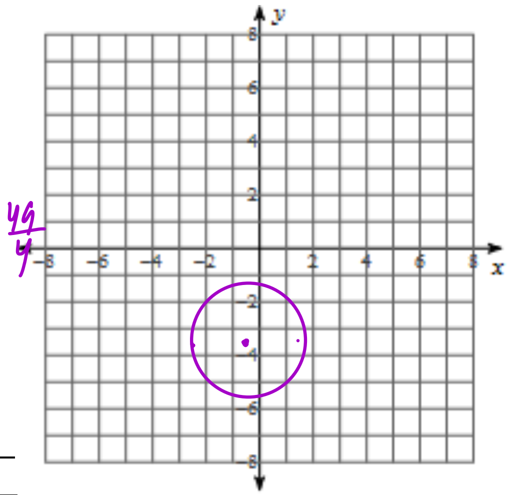
10. Find the required information and graph:

$$2x^2 + 2y^2 + 2x + 14y + 17 = 0$$

$x^2 + y^2 + x + 7y = -\frac{17}{2}$

$x^2 + x + \frac{1}{4} + y^2 + 7y + \frac{49}{4} = -\frac{17}{2} + \frac{1}{4} + \frac{49}{4}$

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



Classify the conic section: circle **Center:** $(-\frac{1}{2}, -\frac{7}{2})$

11. Find the required information. Then graph the conic section.

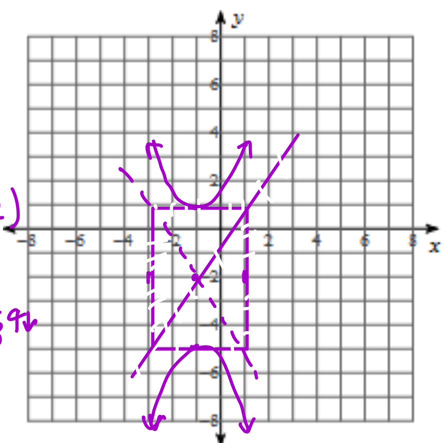
$$-9x^2 + 4y^2 - 18x + 16y - 29 = 0$$

$-9(x^2+2x+1) + 4(y^2+4y+4) = 29 - 9 + 16$

$-9(x+1)^2 + 4(y+2)^2 = 36$

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

center: $(-1,-2)$
$a=3$ ↑↓
$b=2$
$c=\sqrt{13}$ ↑↓



Classify the conic section: hyperbola **Foci:** $(-1, -2 \pm \sqrt{13})$

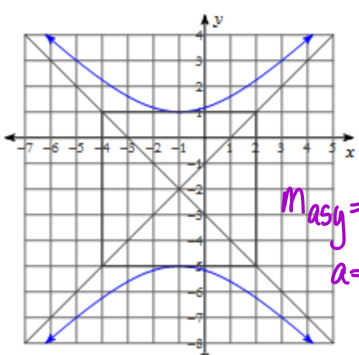
Vertices: $(-1, -2 \pm 3)$ **Asymptotes:** $y+2 = \pm\frac{3}{2}(x+1)$ **Center:** $(-1,-2)$

$(-1,1)$, $(-1,-5)$

12. Write the equation of the hyperbola shown.

center $(-1,-2)$

VTA



$m_{asy} = \pm 1$

$a=b=3$

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

13. Write the equation of the hyperbola in vertex form that has a the following information:

Vertices: (9, 12) and (9, -18) VTA Center: $(9,-3)$

Foci: $(9, -3+\sqrt{229})$ *and* $(9, -3-\sqrt{229})$ $a=15$

$c = \sqrt{229}$

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

$229 = 225 + b^2$

$4 = b^2$

$\frac{(y+3)^2}{225} - \frac{(x-9)^2}{4} = 1$

14. Write the equation of the circle in standard form given the endpoints of the diameter: (-12, 10) and (-18, 12).

Center: (midpt) $(-15, 11)$

radius: (distance) $\sqrt{(-15-(-12))^2 + (11-10)^2}$

$r = \sqrt{9+1}$ $r = \sqrt{10}$

$(x+15)^2 + (y-11)^2 = 10$

15. Use the information provided to write the equation of the ellipse in standard form.

Center: (-9, -5) **Vertex:** (-9, -16) **Focus:** $(-9, -5 + 6\sqrt{2})$

$a = 11$ VMA

$$\frac{(x+9)^2}{49} + \frac{(y+5)^2}{121} = 1$$

$c = 6\sqrt{2}$ or $\sqrt{72}$

$c^2 = a^2 - b^2$

$72 = 121 - b^2$

$49 = b^2$

$b = 7$

Part III: Find the equation for 16-20: { Hint: Graph to help find the equation }

16) Center (7, 3) Vertex (7, 9) Focus (7, -2)

$a = 6$ VMA $(7, -3)$ ellipse

← foci fall inside vertices

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

$c^2 = a^2 - b^2$

$25 = 36 - b^2$

$11 = b^2$

$$\frac{(x-7)^2}{11} + \frac{(y-3)^2}{36} = 1$$

17) Asymptotes: $y = -\frac{5}{4}x + 1$ $y = \frac{5}{4}x - 9$ Focus $(4, -4+\sqrt{41})$

a, b

VTA y term ⊕ "yab"

$c = \sqrt{41}$

center: $(4, -4)$

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

18) Focus (12, 8) Directrix: x = -2

parabola

19) Ellipse with Center(1,2), vertex at (4,2) and contains the point (1,3)

$a = 3$ HMA

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

plug in (1,3)

$0 + \frac{1}{b^2} = 1$

$b^2 = 1$

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

20) Ellipse with Foci(2,7) and (-2,7) and the length of the major axis is 6.

center: $(0, 7)$

$c = 2$

HMA

$2a = 6$

$a = 3$

$c^2 = a^2 - b^2$

$4 = 9 - b^2$

$5 = b^2$

$$\frac{x^2}{9} + \frac{(y-7)^2}{5} = 1$$

Conic Sections Card Match Activity

NAME ______________________ DATE ____________

PARABOLAS	CIRCLES
A E M P	F B H D
ELLIPSES	**HYPERBOLAS**
G J C N	I K L O