Cornell Notes

Name: Adriana Lopez / Asberry

Date: 2/21/12

Topic: UNIT 7 Conics: Eq. of Ellipses

Class/Suject: Alg. 2 p.3

10:10 Notes

Elipse

See "NOTES: DAY 4"

- The set of all pts. in the plane; the sum of whose distances from two fixed points (the foci) is a given constant K.

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

eq. = equation

General Rules:

- x & y are both squared
- eq. allways $= 1$
- eq. is always $+$
- a^2 is always biggest denominator
- $c^2 = a^2 - b^2$
- c is the distance from the center to each foci
- The center is in the middle of the 2 vertices, the 2 covertices, & the 2 foci

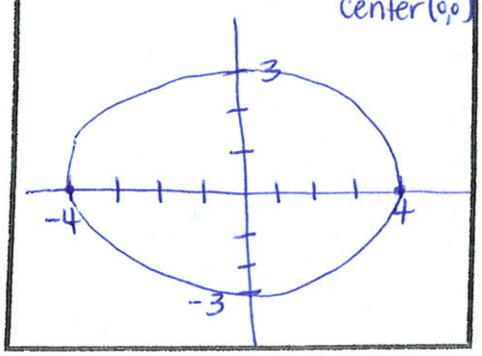
Sketch:

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

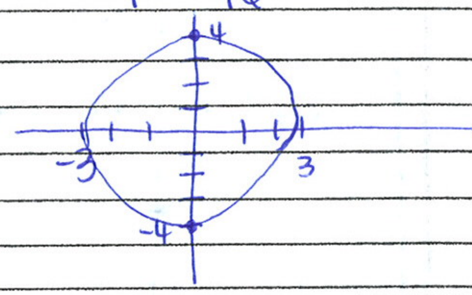
center (0,0)

v $(\pm 4, 0)$

Cv $(0, \pm 3)$



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



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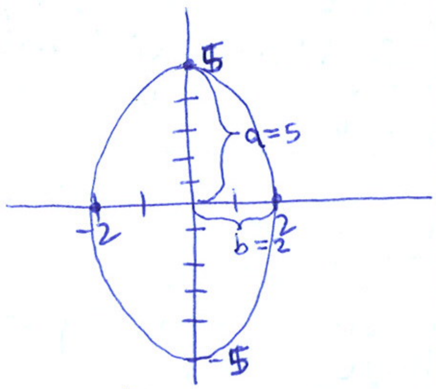
Example 1

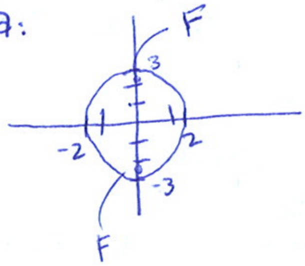


equation:

$$\frac{x^2}{2^2}+\frac{y^2}{5^2}=1 \rightarrow \frac{x^2}{4}+\frac{y^2}{25}=1$$

Example 2

a:



y is major axis (vertical)

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

$a=3$ $b=2$

$V=(0,\pm3)$

$C_v=(\pm2,0)$

Foci:

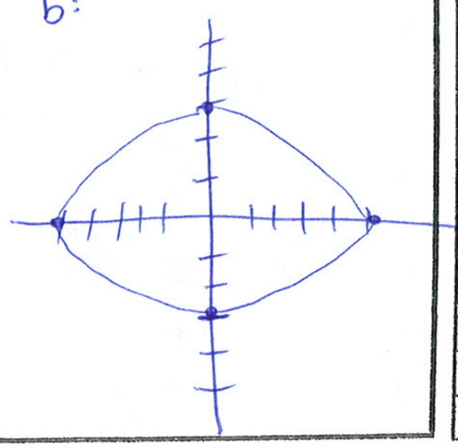
$c^2=a^2-b^2$

$c^2=9-4$

$c^2=5$

$c=\sqrt{5}\approx2.2$ foci

b:



x is major axis (horizontal)

$$\frac{x^2}{100}+\frac{y^2}{36}=1$$

$a=10$ $b=6$

$V=(\pm10,0)$

$C_v=(0,\pm6)$

$F=(\pm8,0)$

FOCI:

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

$c^2=100-36$

$c^2=64$

$c=8$

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Elipses whose center is NOT (0,0):

Horiz. major axis →

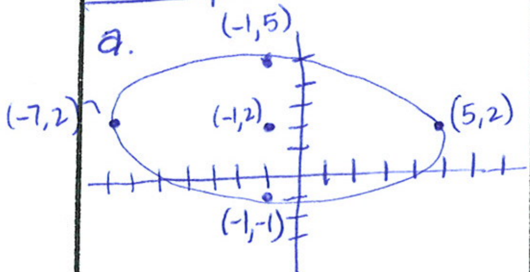
$$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$$

vertical major axis →

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

Example 1

a.



x is major axis (Bigger denominator) horizontal

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

$a=6$ $b=3$

Center $(-1,2)$

V $(5,2)$

V $(-7,2)$

Cv $(-1,-1)$

Cv $(-1,5)$

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

$c^2 = 36 - 9$

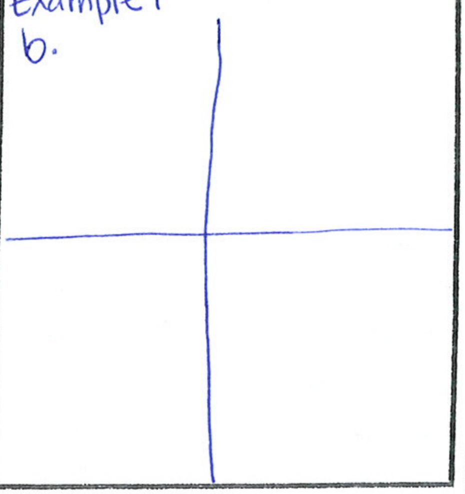
$c^2 = 27 \approx 5.2$

$c = 3\sqrt{3}$

Focus $(-1 \pm 3\sqrt{3}, 2)$

Example 1

b.



y is major axis (vertical)

$$\frac{(x+2)^2}{49} + \frac{(y+3)^2}{225} = 1$$

$a=15$ $b=7$

Center $(-2,-3)$

HOMEWORK: Assignment 5-1: WS 7-4

Cornell Notes

Name

Date

Topic

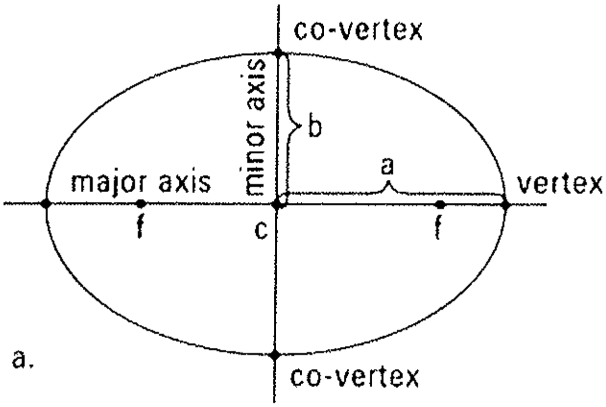
Class/
Suject

ALGEBRA 2-UNIT 7 CONICS
EQUATIONS OF ELLIPSES

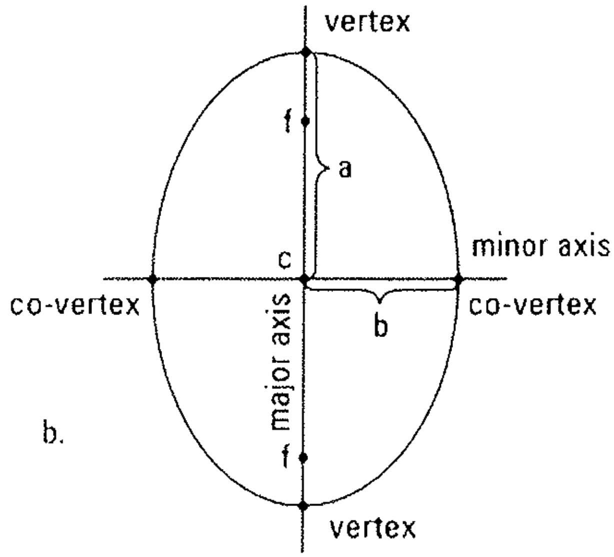
NOTES: DAY 4

An ellipse is a set of points "P" in a plane such that the sum of the distances from "P" to two fixed points F_1 and F_2 is a given constant k.

The major axis is the segment that contains the foci and has its endpoints on the ellipse. The minor axis is perpendicular to the major axis at the center. The endpoints of the minor axis are co-vertices.



a.



b.

Standard Form	Standard Form
Center (0, 0) $\dfrac{x^2}{a^2}+\dfrac{y^2}{b^2}=1$	Center (0, 0) $\dfrac{x^2}{b^2}+\dfrac{y^2}{a^2}=1$
Major axis: Horizontal (x-axis)	Major axis: Vertical (y-axis)
Vertices: $(\pm a, 0)$	Vertices: $(0, \pm a)$
Co-vertices: $(0, \pm b)$	Co-vertices: $(\pm b, 0)$

To find the focus of an ellipse we use a form of the Pythagorean theorem.

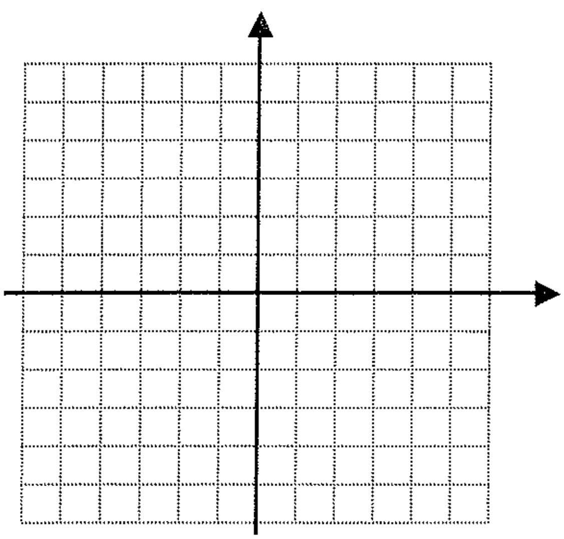
$c^2 = a^2 - b^2$.

NOTE: The largest denominator denotes the MAJOR axis.

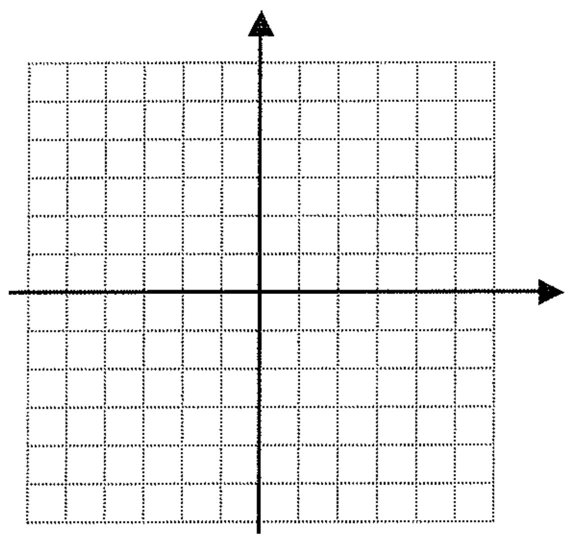
Example 1: Write an equation in standard form of an ellipse that has a vertex at (0, 5) and a co-vertex at (2, 0), and a center at the origin.

Example 2: Find the vertices, co-vertices and foci for each equation of an ellipse. Then graph the ellipse.

a) $\dfrac{x^2}{4}+\dfrac{y^2}{9}=1$



b) $\dfrac{x^2}{100}+\dfrac{y^2}{36}=1$



Let's now look at ellipses whose center is NOT (0, 0).

Type One: Horizontal major axis

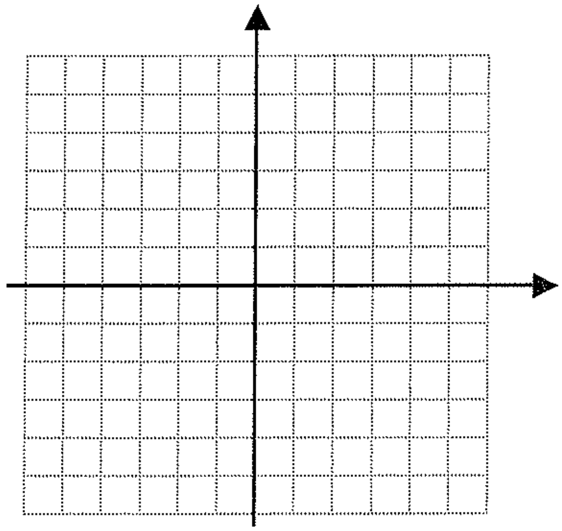
$$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$$

Type Two: Vertical major axis

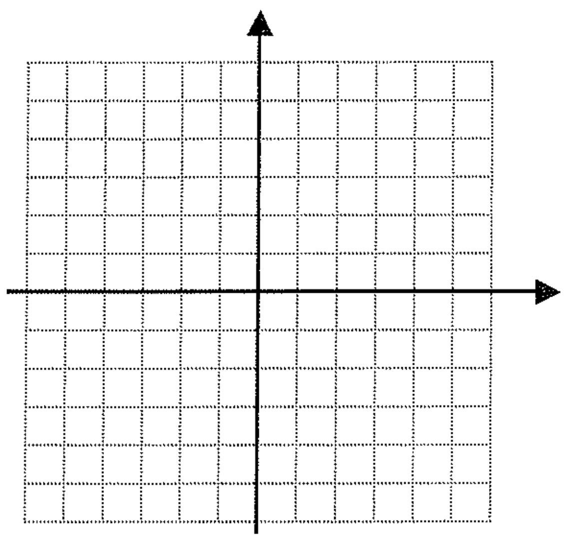
$$\frac{(x-h)^2}{b^2}+\frac{(y-k)^2}{a^2}=1$$

Example 1: Identify the major axis, find the center, identify the a and b values, then graph.

a) $\frac{(x+1)^2}{36}+\frac{(y-2)^2}{9}=1$



b) $\frac{(x+2)^2}{49}+\frac{(y+3)^2}{225}=1$

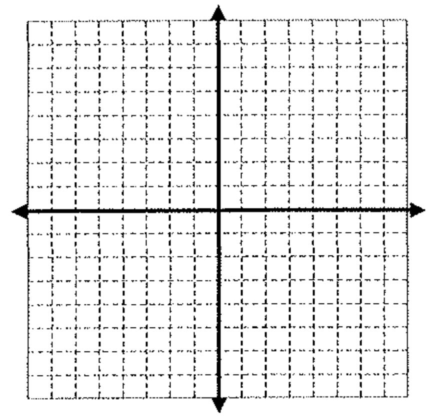


Algebra II Name ______________________________

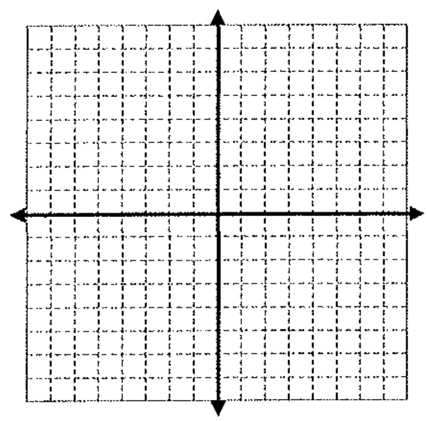
Worksheet 7.4

Find the **center**, **foci**, **vertices**, **co-vertices**, and **eccentricity** of each ellipse. Sketch each graph.

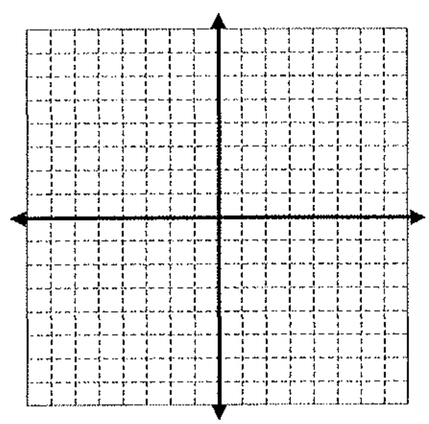
1. $\frac{x^2}{4}+\frac{y^2}{25}=1$



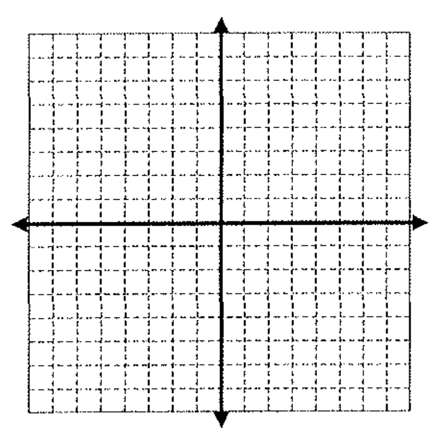
2. $\frac{(x+1)^2}{36}+\frac{(y-2)^2}{16}=1$



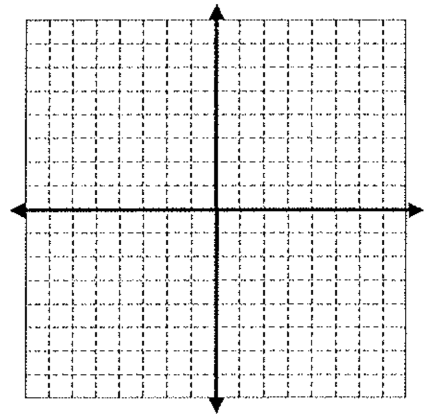
3. $\frac{(x+3)^2}{4}+(y-3)^2=9$



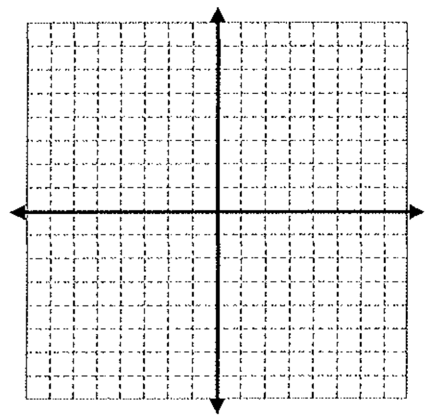
4. $9(x-2)^2+16(y-3)^2=144$



5. $9x^2 - 18x + 4y^2 + 16y = 11$



6. $16x^2 + 25y^2 + 32x - 150y = 159$



7. Write the equation of the ellipse that has a center at (5, 4). The major axis is 10 units and parallel to the x-axis. The minor axis is 6 units.

8. Write the equation of the ellipse whose endpoints of the major axis is (2, 12) and (2, -4). The endpoints of the minor axis are (4, 4) and (0, 4).

Odd Solutions

	Center	**Foci**	**Vertices**	**Co-vertices**	**Eccentricity**
1.	(0, 0)	$(0, \pm\sqrt{21})$	(0, ±5)	(±2, 0)	$\frac{\sqrt{21}}{5}$
3.	(-3, 3)	$(-3 \pm 3\sqrt{3}, 3)$	(3, 3) (-9, 3)	(-3, 6) (-3, 0)	$\frac{\sqrt{3}}{2}$
5.	(1, -2)	$(1, -2 \pm \sqrt{5})$	(1, 1) (1, -5)	(3, -2) (-1, -2)	$\frac{\sqrt{5}}{3}$

7. $\frac{(x-5)^2}{25} + \frac{(y-4)^2}{9} = 1$

ALGEBRA 2-UNIT 7 CONICS

EQUATIONS OF HYPERBOLAS

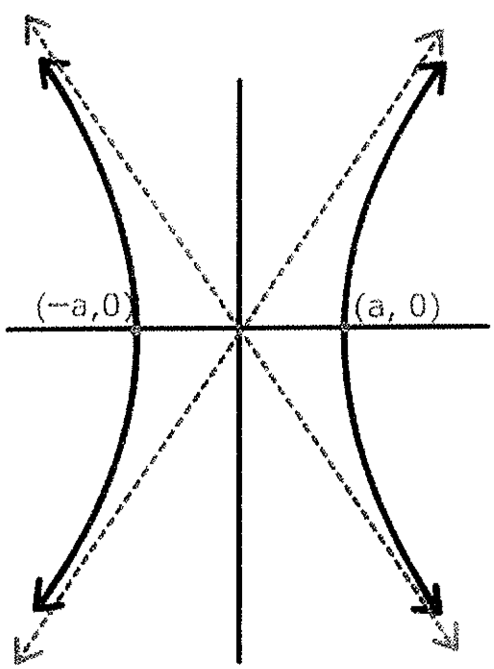
NOTES: DAY 5

A hyperbola is a set of points "P" in a plane such that the absolute value of the difference between the distances from P to two fixed points F_1 and F_2 is a constant "k".

Horizontal Transverse Axis

$$\frac{X^2}{a^2} - \frac{Y^2}{b^2} = 1$$

$y = \frac{-b}{a}x$ $\quad$ $y = \frac{b}{a}x$



Vertices: $(\pm a, 0)$

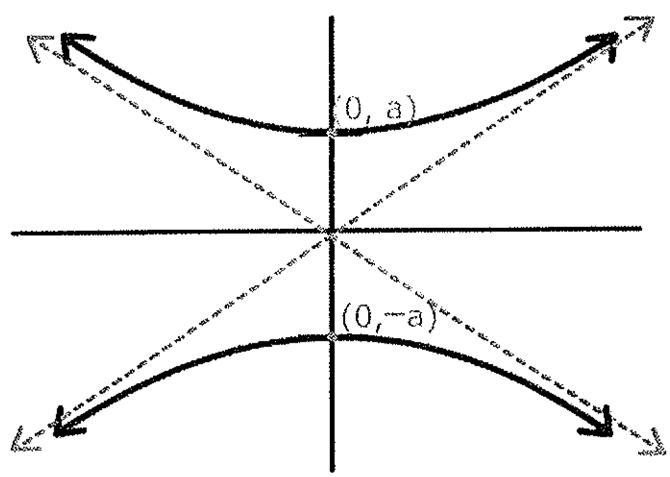
Co-vertices: $(0, \pm b)$

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

Vertical Transverse Axis

$$\frac{Y^2}{a^2} - \frac{X^2}{b^2} = 1$$

$y = \frac{-a}{b}x$ $\quad$ $y = \frac{a}{b}x$



Vertices: $(0, \pm a)$

Co-vertices: $(\pm b, 0)$

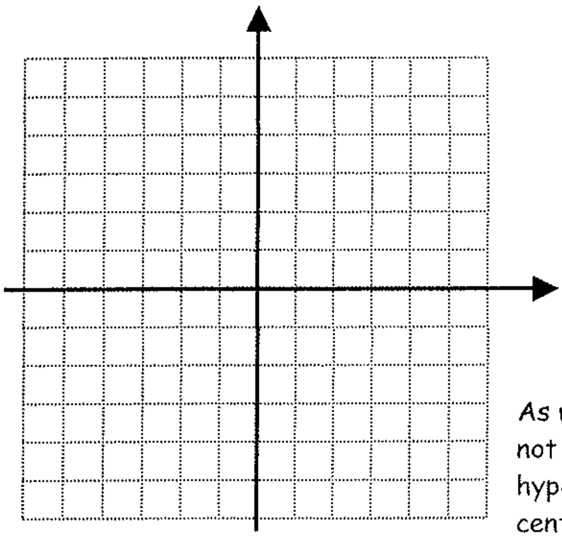
asymptotes: $y = \pm\frac{a}{b}x$

The equation relation a, b, and c is $c^2 = a^2 + b^2$. The hyperbola gets very close to but does not touch the asymptotes!

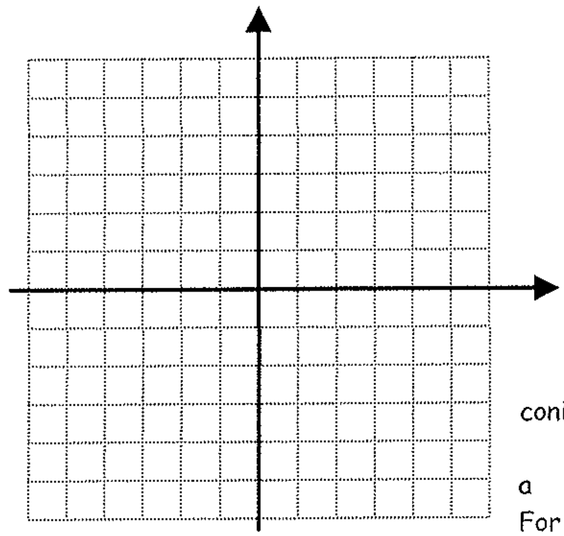
Name:______________________________ Date:_________________________

Example 1: Identify the vertices, co-vertices, and asymptotes of each equation, then graph.

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



b) $\frac{y^2}{36}-\frac{x^2}{100}=1$



As with all conics not all hyperbolas have a center (0, 0). For hyperbolas with a center at (h, k) the equations are as follows:

Type one: Horizontal axis

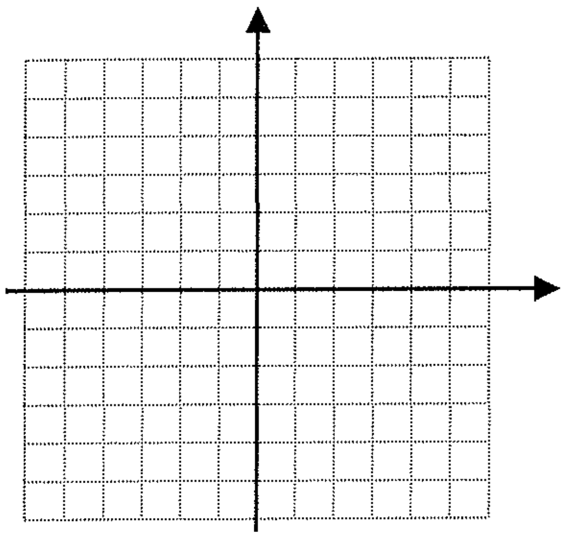
$$\frac{(x-h)^2}{a^2}-\frac{(y-k)^2}{b^2}=1$$

Type two: Vertical axis

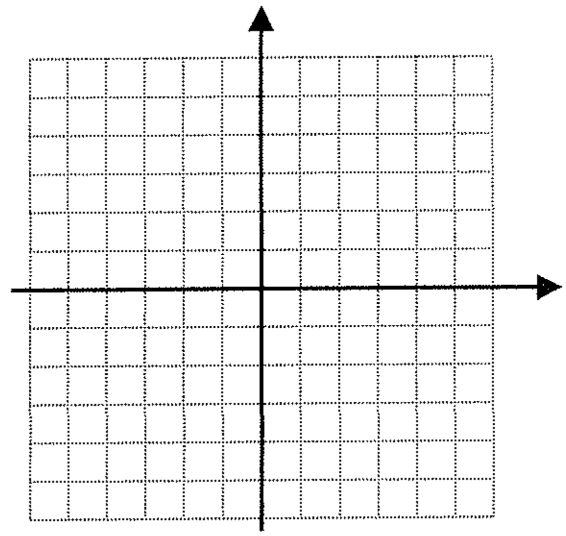
$$\frac{(y-k)^2}{a^2}-\frac{(x-h)^2}{b^2}=1$$

Example 2: Graph each hyperbola, labeling the vertices, centers, and asymptotes.

a) $\frac{(x-3)^2}{4}-\frac{(y+5)^2}{121}=1$



b) $\frac{(y-16)}{36}-\frac{(x+4)^2}{25}=1$

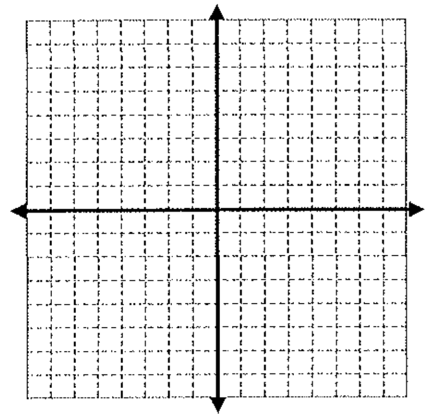


Algebra II
Worksheet 7.5

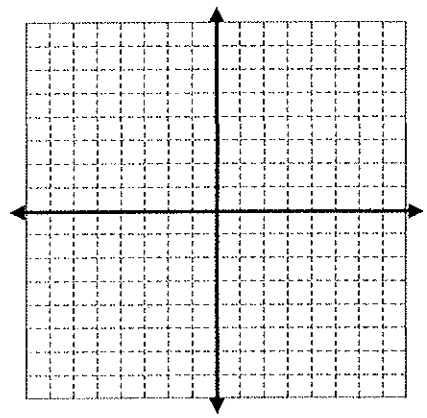
Name ______________________________

Find the **center**, **vertices,** **co-vertices**, **foci**, and equations of the **asymptotes** for each hyperbola. Sketch each graph.

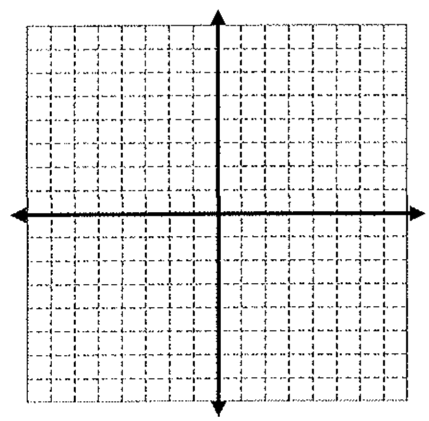
1. $\frac{x^2}{9}-\frac{y^2}{25}=1$



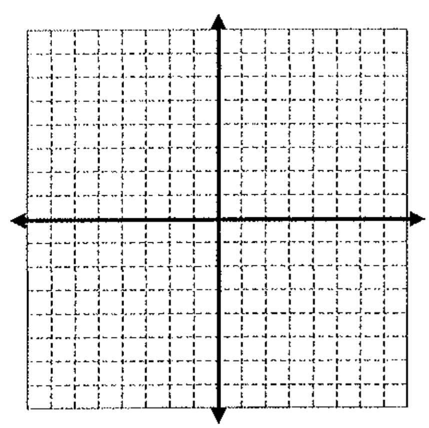
2. $\frac{y^2}{9}-\frac{x^2}{16}=1$



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



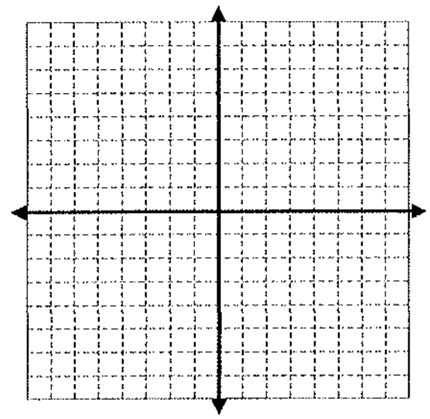
4. $\frac{(y+4)^2}{4}-\frac{(x+1)^2}{9}=1$



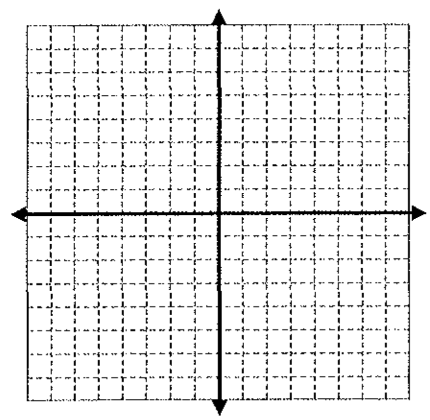
5. Write the equation of the hyperbola with center at (5, 4) with a = 2, b = 6 where there is a vertical transverse axis.

6. Write the equation of the hyperbola with center (0, -3) with b = 3, c = 5 where there is a horizontal transverse axis.

7. $y^2 - 2y - 4x^2 - 16x + 1 = 0$



8. $25y^2 + 100y - 9x^2 + 18x = 134$



9. Write the equation of the hyperbola with vertices (2, -9) and (2, 15) where the slope of one asymptote $= \frac{2}{5}$.

10. Write the equation of the hyperbola with vertices (-1, 3) and (5, 3) and foci (-3, 3) and (7, 3).

Odd Solutions ...

	Center	Vertices	Co-vertices	Foci	Asymptotes
1.	(0, 0)	(3, 0) (-3, 0)	(0, 5) (0, -5)	$(\pm\sqrt{34}, 0)$	$y = \pm\frac{5}{3}x$
3.	(-3, 2)	(-8, 2) (2, 2)	(-3, 6) (-3, -2)	$(-3 \pm\sqrt{41}, 2)$	$y = \frac{4}{5}x + \frac{22}{5},\ y = -\frac{4}{5}x - \frac{2}{5}$
7.	(-2, 1)	(-2, 3) (-2, -1)	(-1, 1) (-3, -1)	$(-2, 1 \pm\sqrt{5})$	$y = 2x + 9,\ y = -2x - 7$

5. $\frac{(y-4)^2}{4} - \frac{(x-5)^2}{36} = 1$

9. $\frac{(y-3)^2}{144} - \frac{(x-2)^2}{900} = 1$

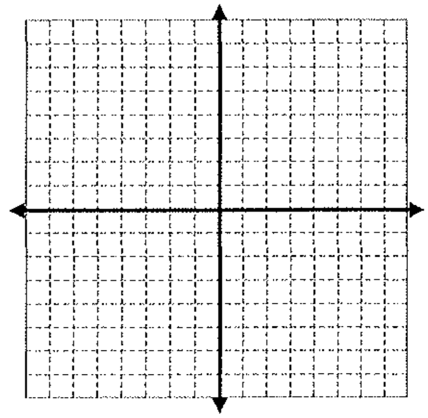
Algebra II

Unit 7 Review Worksheet

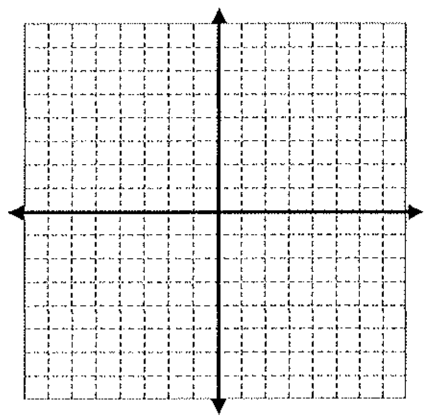
Name ______________________________

Identify the typical information for each conic section and sketch the graph.

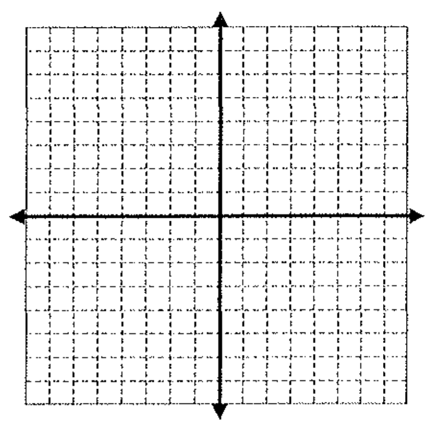
1. $4x^2 - 56x + 9y^2 + 108y + 484 = 0$



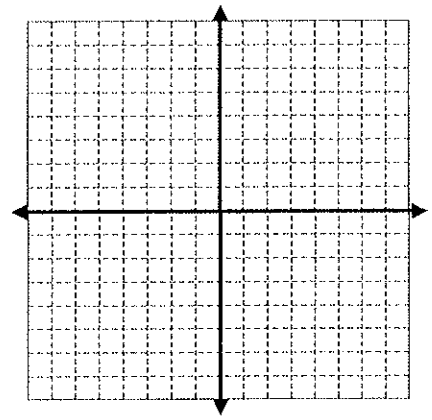
2. $4y - x^2 - 8x - 6 = 14$



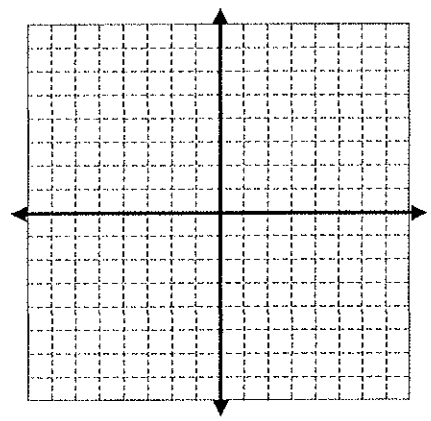
3. $x^2 + 2x + y^2 - 2y - 8 = 0$



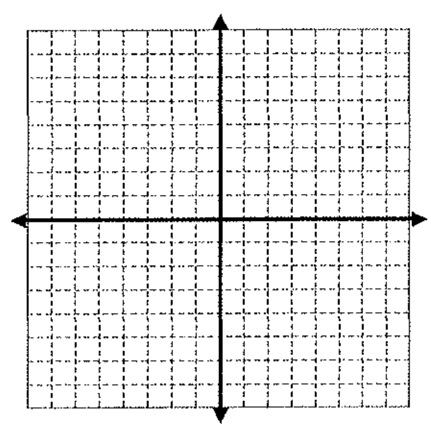
4. $x + 3y^2 + 18y + 28 = 0$



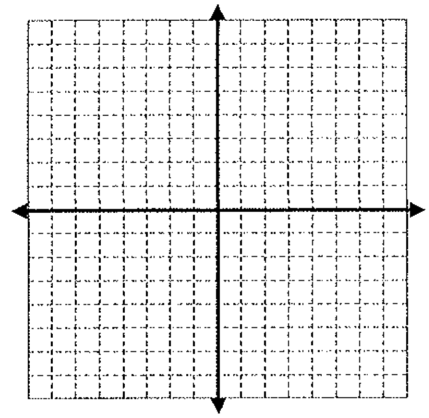
5. $y^2 - 2y - 4x^2 - 16x - 19 = 0$



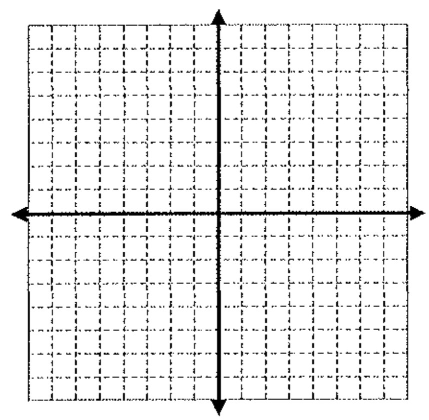
6. $16x^2 - 192x + 4y^2 + 16y + 528 = 0$



7. $49x^2 - 25y^2 + 294x + 200y = 1184$



8. $2x^2 - 4x + 2y^2 + 12y + 5 = 3$



9. Find the point(s) of intersection of $\begin{cases} y^2 - 2x - 10y + 31 = 0 \\ x - y + 2 = 0 \end{cases}$

10. Find the point(s) of intersection of $\begin{cases} 9x^2 - 16y^2 + 18x + 153 = 0 \\ 9x^2 + 16y^2 + 18x - 135 = 0 \end{cases}$

11. Write the equation of the parabola with focus (3, -1) and directrix $x = 7$

12. Write the equation of the ellipse with foci (3, -3) (3, 5) and co-vertices (1, 1) (5, 1).

13. Write the equation of the hyperbola with vertices (1, -5) (1, 3) and the slopes of the asymptotes are 2 and -2.

14. Write the equation of the circle that has endpoints of a diameter at (-2, -3) and (4, 5).

Solutions ... 1. ELLIPSE: center (7, -6), vert (10, -6) (4, -6), co-vert (7, -4) (7, -8), foci ($7 \pm \sqrt{5}$, -6), ecc $= \frac{\sqrt{5}}{3}$

2. PARABOLA: vertex (-4, 1), focus (-4, 2), directrix $y = 0$, LR = 4

3. CIRCLE: center (-1, 1), radius $\sqrt{10}$

4. PARABOLA: vertex (-1, -3), focus ($-1\frac{1}{12}$, -3), directrix $x = -\frac{11}{12}$, LR $= \frac{1}{3}$

5. HYPERBOLA: center (-2, 1), vert (-2, 3) (-2, -1), co-vert (-1, 1) (-3, 1), foci (-2, $1 \pm \sqrt{5}$), asy $y - 1 = \pm 2(x + 2)$

6. ELLIPSE: center (6, -2), vert (6, 2) (6, -6), co-vert (8, -2) (4, -2), foci (6, $-2 \pm 2\sqrt{3}$), ecc $= \frac{\sqrt{3}}{2}$

7. HYPERBOLA: center (-3, 4), vert (2, 4) (-8, 4), co-vert (-3, 11) (-3, -3), foci ($-3 \pm \sqrt{74}$, 4), asy $y - 4 = \pm\frac{7}{5}(x + 3)$

8. CIRCLE: center (1, -3), radius 3

9. (5, 7) (3, 5)

10. (-1, 3) (-1, -3)

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

12. $\frac{(x-3)^2}{4} + \frac{(y-1)^2}{20} = 1$

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

14. $(x-1)^2 + (y-1)^2 = 25$