Name: ______________________________ Date: ______________________________

Period: _____ Pre-Calculus: Conics Introduction

Classify each of the following conic sections. On the line provided, write whether the given conic is a circle, ellipse, hyperbola, or parabola.

(1)

1. $3x^2+y^2-6x-3=0$ Ellipse
2. $2x^2-y^2+12x+14=0$ Hyperbola
3. $4y^2-16x-12y-23=0$ Parabola
4. $2x^2+2y^2-3y-1=0$ Circle.
5. $2x^2-3y=0$ Parabola
6. $x^2+y^2+2x-2y-2=0$ Circle
7. $2x^2-2y^2+60y-63=0$ Hyperbola
8. $4x^2+9y^2-16x+72y+124=0$ Ellipse
9. $16x^2+4y^2+64x-12y+57=0$ Ellipse
10. $y^2-4y-5x-1=0$ Parabola
11. $25x^2-9y^2+150x+36y-36=0$ Hyperbola

(2) Sketch pad

(3)

Let's take this equation in *general* form, and put it in standard form

$$4x^2+25y^2-24x-64=0$$

$4x^2-24x+25y^2=64$

$4(x^2-6x+9)+25y^2=64+36$

$$\frac{4(x-3)^2}{4\cdot 25}+\frac{25y^2}{4\cdot 25}=\frac{100}{4\cdot 25}$$

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

Definitions

- **Ellipse** – If F_1 $(c, 0)$ and F_2 $(-c, 0)$ are two fixed points in a plane and a is a constant, $0 < c < a$, then the set of all points P in the plane such that $PF_1 + PF_2 = 2a$ is an ellipse
- **Focus Point** (plural – foci) – the fixed points F_1 and F_2
- **Major Axis** – The longest diameter of an ellipse
- **Minor Axis** – The shortest diameter of an ellipse

Algebraic Definition of Ellipse

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

Center → (h,k)

$2a$ = Horizontal ~~Asymptote~~ Axis

$2b$ = Vertical ~~Asymptote~~ Axis

c = Horizontal distance Focus to center.

(4) Do two As a class.

(5) Write the Equation

(6) Classwork

Name: ______________________ Date: ______________________

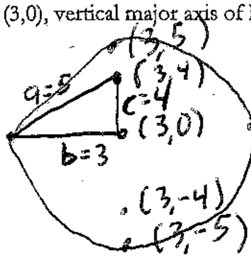
Period: _______ Pre-Calculus

Writing Equations for Ellipses

1. Write the equation for an ellipse with center (3,0), vertical major axis of length 10 and minor axis of length 6.

$$\frac{(x-3)^2}{9} + \frac{y^2}{25} = 1$$

(3,3)



(3,-3)

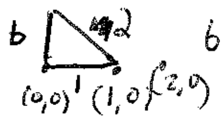
2. Write the equation for an ellipse with center (-1, -1) with horizontal major axis of length 16 and minor axis of length 4. $b=2$

$a=8$

$$\frac{(x+1)^2}{64} + \frac{(y+1)^2}{4}$$

3. Write the equation for an ellipse with foci (-1,0) and (1,0) and major axis of length 4.

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

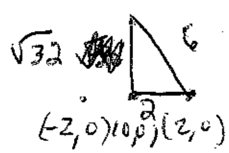


$b=\sqrt{3}$

4. Write the equation for an ellipse with vertices at (6,0) and (-6,0) and foci at (2,0) and (-2,0)

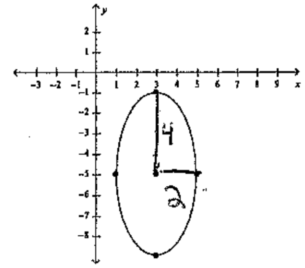
$$\frac{x^2}{36} + \frac{y^2}{32} = 1$$

(-6,0)



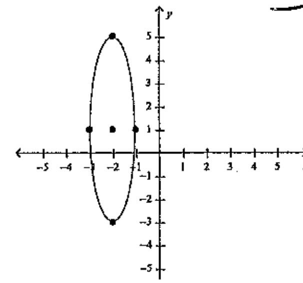
(6,0)

5.



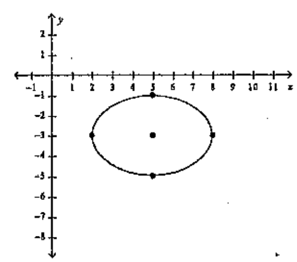
$$\frac{(x-3)^2}{4} + \frac{(y+5)^2}{16} = 1$$

6.



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

7.



$$\frac{(x-5)^2}{9} \quad \frac{(y+3)^2}{4} = 1$$

Name: ______________________ Date: ______________________

Period: ________ Pre-Calculus: ***Ellipse Classwork Worksheet***

1. Find the center, vertices, covertices, foci, length of major and minor axes, and sketch the graph.

a. $\frac{(x-4)^2}{9}+\frac{(y+3)^2}{25}=1$

center: (4, -3)

major axis: X = 4

minor axis: Y = -3

vertices: (4, 2) (4, -8)

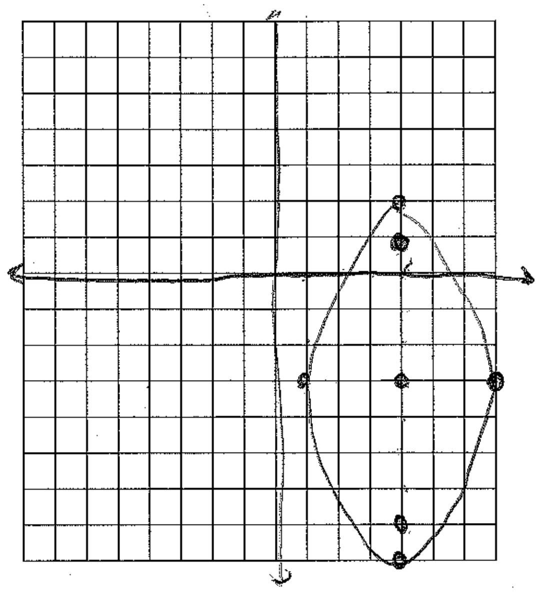
covertices: (1, -3) (7, -3)

foci: (4, 1) (4, 7)

$9 = 25 - c^2$

$-16 = -c^2$

$4 = c$



b. $x^2+5y^2-8x-30y-39=0$

$x^2-8x+5y^2-30y=39$

$(x^2-8x+16)+5(y^2-6y+9)=39+45+16$

$\frac{(x-4)^2}{100}+\frac{5(y-3)^2}{100}=\frac{100}{100}$

$\frac{(x-4)^2}{100}+\frac{(y-3)^2}{20}=1$

center: (4, 3)

major axis: Y = 3

minor axis: X = 4

vertices: (14, 3), (-6, 3)

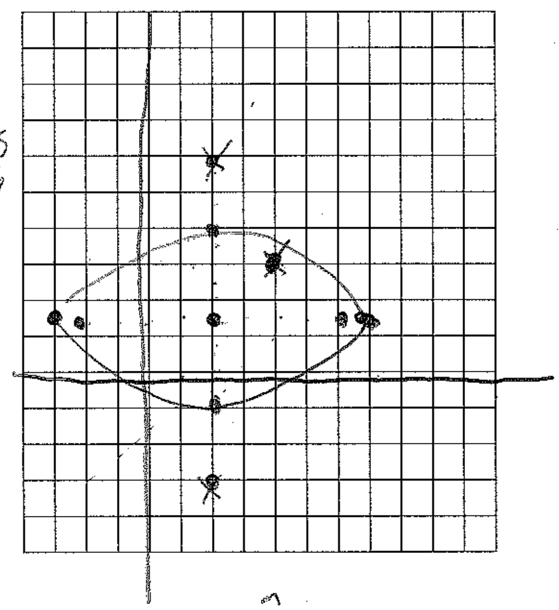
covertices: $(4, 3+\sqrt{20})(4, 3-\sqrt{20})$

foci: $(4-\sqrt{80}, 3)$ $(4+\sqrt{80}, 3)$

$20 = 100 - c^2$

$-80 = -c^2$

$c = \sqrt{80}$



c. $9x^2+4y^2+54x+8y+49=0$

$9x^2+54x+4y^2+8y=-49$

$9(x^2+6x+9)+4(y^2+2y+1)=-49+81+4$

$\frac{9(x+3)^2}{36}+\frac{4(y+1)^2}{36}=\frac{36}{36}$

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

center: (-3, -1)

major axis: X = -3

minor axis: Y = -1

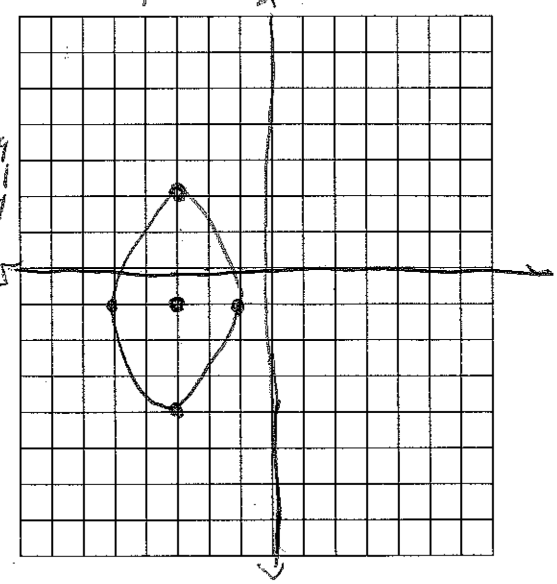
vertices: (-3, 2), (-3, -4)

covertices: (-1, -1) (-5, -1)

foci: $(-3, -1+\sqrt{5})$

$(-3, -1-\sqrt{5})$

$9 - 4 = \sqrt{5}$



d. $25x^2 + y^2 - 300x + 8y + 891 = 0$

center: $(6,-4)$

major axis: $X=6$

minor axis: $Y=-4$

vertices: $(6,1)\ (6,-9)$

covertices: $(7,-4)\ (5,-4)$

foci: $(6,-4+\sqrt{24}),(6,-4-\sqrt{24})$

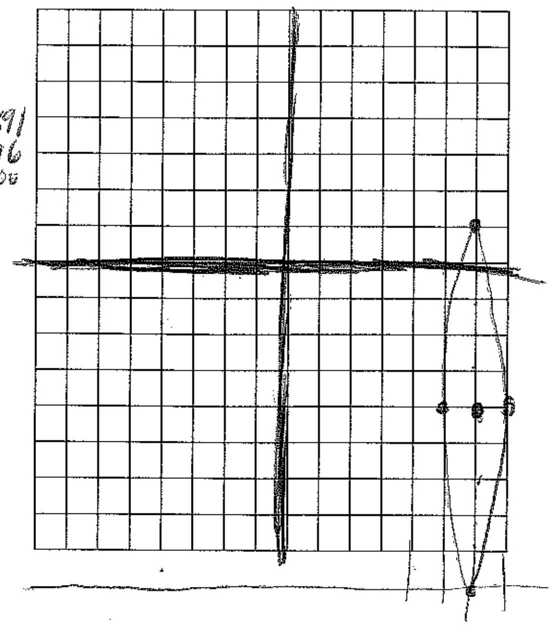
$$25X^2-300X+Y^2+8Y=-891$$

$$25(X^2-12X+36)+Y^2+8Y+16=-891+16+900$$

$$\frac{25(X-6)^2}{25}+\frac{(Y+4)^2}{25}=\frac{25}{25}$$

$$\frac{(X-6)^2}{1}+\frac{(Y+4)}{25}=1$$

$$1-25=\sqrt{24}$$



2. Write the equation of an ellipse given the provided information.

a. Vertices at (3, 1) and (3, 9). Minor axis of length 6. → $a=3$

Major Axis → 8 $b=4$ center $(3,5)$

$$\frac{(X-3)^2}{9}+\frac{(Y-5)^2}{16}=1$$

b. Vertices at (5, 0) and (5, 12). Covertices at (0, 6) and (10, 6)

$b=6$ Center $(5,6)$ $a=5$

$$\frac{(X-5)^2}{25}+\frac{(Y-6)^2}{36}=1$$

c. Foci are at (1, 0) and (-1, 0) and the length of the major axis is 4.

Center $(0,0)$ $a=2$ $C=1$

$$\frac{X^2}{4}+\frac{Y^2}{3}=1$$

$b^2=2^2-1^2$

$b^2=3$

$b=\sqrt{3}$

d. Vertical major axis is 10, minor axis is 6, and center is (3, 0).

$a=3$ $b=5$

$$\frac{(X-3)^2}{9}+\frac{Y^2}{25}=1$$