ALGEBRA II **REVIEW Chapter 9** Name KEY

Hour ______

## FROM SECTION 9.1

MAJOR POINTS:
- Distance Formula
- Midpoint Formula
- Classifying a Triangle
- Finding a perpendicular bisector

Classify the triangle with vertices A (3, 5), B (6, 9), and C (11, 9).

$AB = \sqrt{25}$
$= 5$

$BC = \sqrt{25}$
$= 5$

$AC = \sqrt{80}$

Isosceles

Write an equation for the perpendicular bisector of the line segment joining the two points.

(1, 4) and (6, -6)

original slope $\frac{10}{-5} = -2$

$\perp$ bisector slope $m = \frac{1}{2}$

midpoint $\left(\frac{1+6}{2}, \frac{4+-6}{2}\right) = \left(\frac{7}{2}, -1\right)$

x y

$y + 1 = \frac{1}{2}\left(x - \frac{7}{2}\right)$

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

$y + \frac{4}{4} = \frac{2}{4}x + \frac{-7}{4}$

$\boxed{y = \frac{1}{2}x + \frac{-11}{4}}$

## *FROM SECTION 9.2*

MAJOR POINTS:

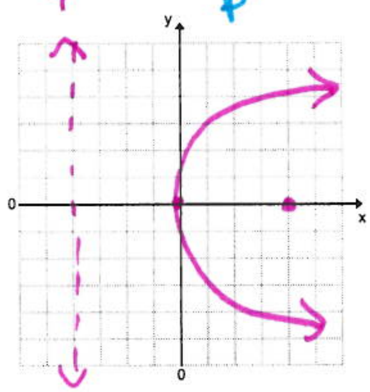
- Graphing a Parabola
- Writing an Equation of a Parabola

Graph the equations. Identify the focus, directrix, and axis of symmetry of the parabola.

$y^2 - 16x = 0$

$y^2 = 16x$

$y^2 = 4(\underset{p}{4})x$

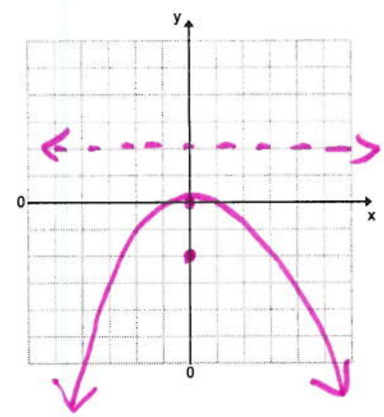



Focus: (4,0)

directrix: x = -4

$y = -\frac{1}{8}x^2 \rightarrow x^2 = -8y$

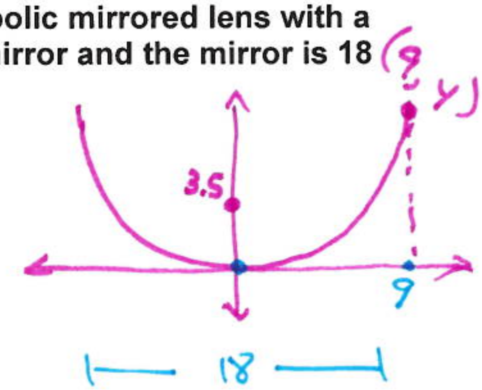
$x^2 = 4(\underset{p}{-2})y$




Focus: (0,-2)

directrix: y = 2

**A focused light beam that points up from a headlight uses a parabolic mirrored lens with a light source as its focus. The light source is 3.5 inches from the mirror and the mirror is 18 inches across.**




a. Write an equation that models the mirror.

$x^2 = 4(3.5)y$

$\boxed{x^2 = 14y}$

b. Find the depth of the mirror.

$9^2 = 14y$

$\boxed{y \approx 5.79 \text{ in.}}$

## *FROM SECTION 9.3*

MAJOR POINTS:

- Graph an Equation of a Circle
- Write an Equation of a Circle
- Write an Equation of the Tangent Line to a Circle
- Write and Apply a Circular Model

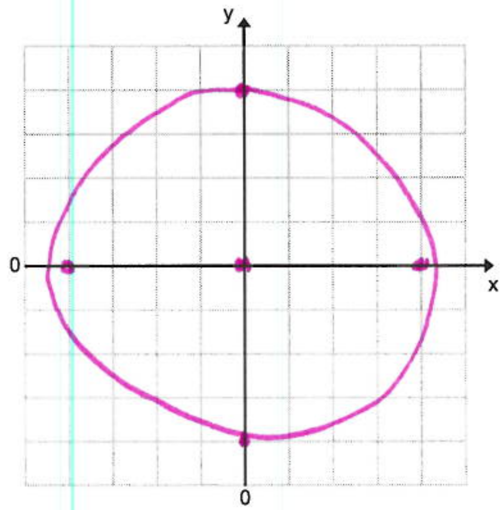
Graph the Equation. Identify the radius of the circle.

$4x^2 = 64 - 4y^2$

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

$x^2 + y^2 = 16$

radius : 4




Write the standard form of the equation of the circle with the given radius and whose center is the origin.

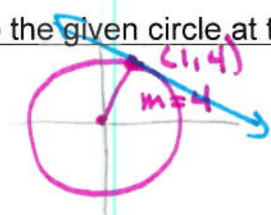
$4\sqrt{6}$

$x^2 + y^2 = (4\sqrt{6})^2$

$\boxed{x^2 + y^2 = 96}$

Write an equation of the line tangent to the given circle at the given point.

$x^2 + y^2 = 17$ $\qquad$ $\overset{x\ \ y}{(1, 4)}$




orignal $m = 4$

tangent $m = -\frac{1}{4}$

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

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

$y - \frac{16}{4} = -\frac{1}{4}x + \frac{1}{4}$

$\boxed{y = -\frac{1}{4}x + \frac{17}{4}}$

## *FROM SECTION 9.4*

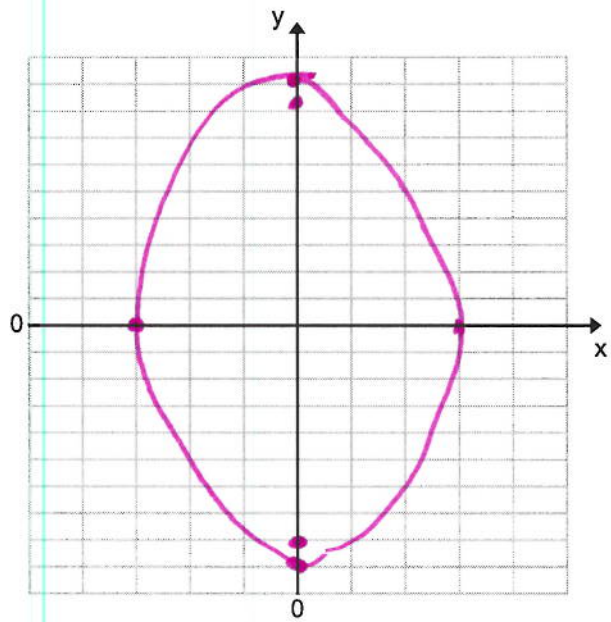
MAJOR POINTS:

- Graph an Equation of an Ellipse
- Write an Equation of an Ellipse given a Vertex and Co - Vertex
- Write an Equation of an Ellipse given a Vertex and Focus

Graph the equation. Identify the relevant parts.

$$\frac{72x^2}{648} + \frac{8y^2}{648} = \frac{648}{648}$$

$$\frac{x^2}{9} + \frac{y^2}{81} = 1$$




Vertices $(0, \pm 9)$

Foci $(0, \pm 6\sqrt{2})$

co-vertices $(\pm 3, 0)$

~~Asymptotes~~ ______

$$c^2 = a^2 - b^2$$
$$c^2 = 81 - 9$$
$$c^2 = 72 \qquad c = \pm 6\sqrt{2} = \pm 8.49$$

Write an equation of the ellipse with the given characteristics and center at (0, 0).

Vertex: (5, 0) a
Co - Vertex: (0, -3) b

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

Co - Vertex: (-32, 0) b on x-axis
Focus: (0, 24)

$$\frac{x^2}{1024} + \frac{y^2}{a^2} = 1 \quad \text{so} \quad \boxed{\frac{x^2}{1024} + \frac{y^2}{1600} = 1}$$

$$24^2 = a^2 - 1024$$
$$+1024 \qquad +1024$$
$$a^2 = 1600$$

## *FROM SECTION 9.5*

MAJOR POINTS:

- Graph an Equation of a Hyperbola
- Write an Equation of a Hyperbola

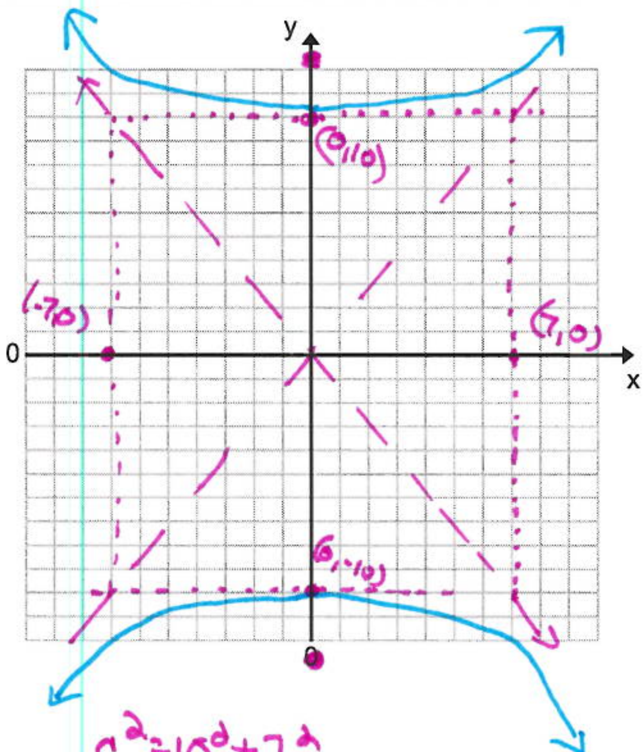
Graph the equation. Identify the relevant parts (look at yellow sheet to know what relevevant parts are needed)

$$\frac{49y^2}{4900} - \frac{100x^2}{4900} = \frac{4900}{4900}$$

$$\frac{y^2}{100} - \frac{x^2}{49} = 1$$

since $y^2$ first it makes a "y"

vertices: $(0, \pm 10)$
foci: $(0, \pm\sqrt{149})$
asymptotes:
$y = \pm \frac{10}{7}x$
center: $(0,0)$




$c^2 = 10^2 + 7^2$
$c^2 = 149$
$c = \sqrt{149} \approx 12.2$

Write an equation of the hyperbola with the given foci and vertices.

| | | | | |
|---|---|---|---|---|
| Foci: | (0, -4) and (0, 4) $c$ | | ★ Foci: | (~~-6, 0~~) (0, -6) and (~~6, 0~~) (0, 6) $c$, $c^2 = 36$ |
| Vertices: | (0, -2) and (0, 2) ← on y-axis so y first; $a$, $a^2 = 4$ | | Co-Vertices: | (-2, 0) and (2, 0) $b$, $b^2 = 4$ |

on x-axis so goes under x in second position since it's co-vertices

$c^2 = a^2 + b^2$
$16 = 4 + b^2$
$b^2 = 12$

$$\boxed{\frac{y^2}{4} - \frac{x^2}{12} = 1}$$

$c^2 = a^2 + b^2$
$36 = a^2 + 4$
$a^2 = 32$

$$\boxed{\frac{y^2}{32} - \frac{x^2}{4} = 1}$$

## *FROM SECTION 9.6*

MAJOR POINTS:

- Graph the equation of a Translated Circle, Hyperbola, Parabola, and Ellipse
- Identify Symmetries of Conic Sections
- Classifying Conics

yes, you should do this!

Name the conic section. Identify the important characteristics and ~~line(s) of symmetry~~.

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

vertex: -4,2
focus: (-4,0)
directrix: y = 4

a.o.s. x = -4

$\dfrac{(y+4)^2}{49_{a^2}} - \dfrac{(x+8)^2}{9_{b^2}} = 1$ hyperbola

center: (-8,-4)
vertices: (-8,3) (-8,-11)
foci: (-8, 3.62) (-8,-11.62)

$c^2 = a^2 + b^2$
$c^2 = 49 + 9$
$c^2 = 58$
$c \approx 7.62$

a.o.s. x = -8, y = -4

$\dfrac{(x+2)^2}{16_{b^2}} + \dfrac{(y-2)^2}{36_{a^2}} = 1$ Ellipse

a.o.s. x = -2, y = 2

center: (-2,2)
vertices: (-2,8) (-2,-4)
co-vert: (2,2) (-6,2)
foci: (-2, 6.47) (-2,-2.47)

$(x + 2)^2 + (y + 1)^2 = 121$ Circle

center: (-2,-1)
radius: 11

a.o.s. any going through the point (-2,-1

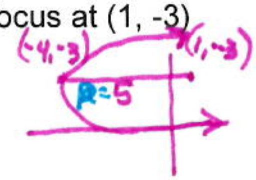
Write an equation of the conic section.

Circle with center at (-5, 1) and radius of 6

$(x-h)^2 + (y-k)^2 = r^2$

$\boxed{(x+5)^2 + (y-1)^2 = 36}$

Parabola with vertex at (-4, -3) and focus at (1, -3)




$(y+3)^2 = 20(x+4)$

↑ 4·5

Ellipse with vertices at (-3, 4) and (5, 4) ~~and~~ foci at (-1, 4) and (3, 4)

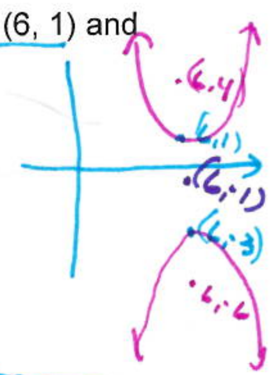

mdpt. (1,4)

a: four units away
c: 2 units away

$c^2 = a^2 - b^2$
$4 = 16 - b^2$
$b^2 = 12$
$a^2 = 16$

$\boxed{\dfrac{(x-1)^2}{16} + \dfrac{(y-4)^2}{12} = 1}$

Hyperbola with vertices at (6, -3) and (6, 1) and foci at (6, -6) and (6, 4)




mdpt. (center) (6,-1)

a: 2 units away
c: 5 units away

$c^2 = a^2 + b^2$
$25 = 4 + b^2$
$b^2 = 21$
$a^2 = 4$

$\boxed{\dfrac{(y+1)^2}{4} - \dfrac{(x-6)^2}{21} = 1}$

~~Use the discriminant to~~ classify the conic section and write its equation in standard form.

$x^2 + y^2 - 10x - 6y + 18 = 0$ circle

$(x-5)^2+(y-3)^2=16$

$4x^2 + y^2 - 48x - 14y + 189 = 0$ Ellipse

$(x-6)^2+\frac{(y-7)^2}{4}=1$

$x^2 - 18x + 6y + 99 = 0$ parabola

$(x-9)^2=-6(y+3)$

$16x^2-9y^2-96x+36y-36=0$ hyperbola

$\cancel{8x^2 - 9y^2 - 40x + 4y + 145 = 0}$

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

Graph the equations and identify the relevant parts (look at yellow sheet to know what relevant parts are needed)

$(x-3)^2 = 12(y+2)$

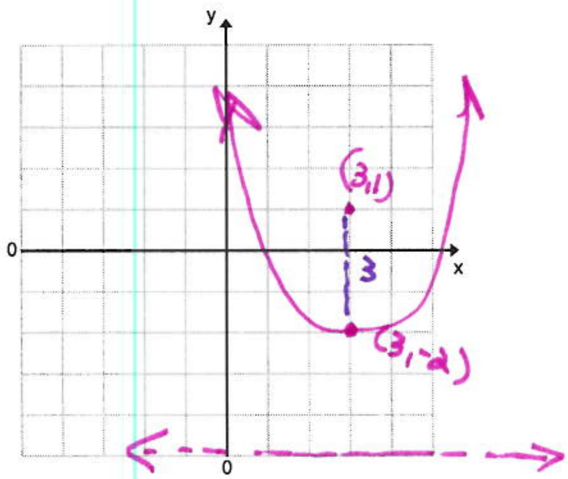
$p=3$

three relevant parts

(3,-2) vertex

(3,1) focus

y=-5 directrix




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

$a=3 \rightarrow 9$ $\quad 16 - b^2$

h,k (3,-1)

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

$c^2=9+16$

$c=\pm 5$

three relevant parts

(3,-1) center

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

(3,4) (3,-6) foci