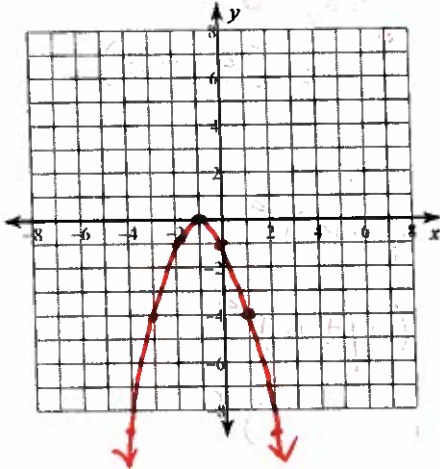


Conic Sections- Circles, Ellipses and Parabolas

Identify the vertex, focus, directrix, direction of opening, min/max value, y-intercept, and x-intercepts of each. Then sketch the graph.

1)  $y + 1 = -2x - x^2$



$$y + 1 = -(x^2 + 2x + 1)$$

$$y = -(x + 1)^2$$

v: (-1, 0)

down

max: 0

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

Focus:  $(-1, -\frac{1}{4})$

Directrix  $y = \frac{1}{4}$

$$0 = -(x + 1)^2$$

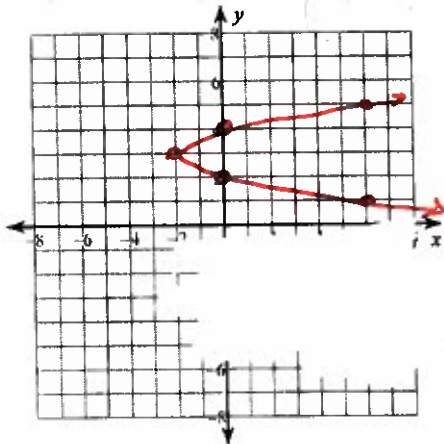
x = -1 x-int: (-1, 0)

$$y = -(0 + 1)^2$$

y = -1 y-int: (0, -1)

Identify the vertex, focus, directrix, direction of opening, x-intercept, and y-intercepts of each. Then sketch the graph.

2)  $-2y^2 + x + 12y - 16 = 0$



$$x - 16 = 2y^2 - 12y + 18$$

+18

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

Right

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

v: (-2, 3) F:  $(-1\frac{7}{8}, 3)$

$$\frac{1}{4(2)} = \frac{1}{8}$$

D:  $x = -2\frac{1}{8}$

$$x + 2 = 2(0 - 3)^2$$

$$x = 18 - 2$$

$$0 + 2 = 2(y - 3)^2$$

x-int: (16, 0)

$$1 = (y - 3)^2$$

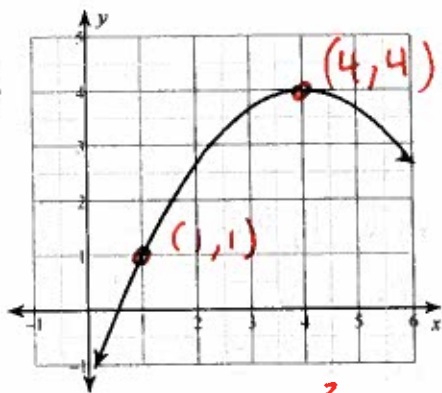
$$\pm 1 = y - 3$$

$$3 \pm 1 = y$$

y-int: (0, 4) (0, 2)

Use the information provided to write the vertex form equation of each parabola.

3)



$$y - k = a(x - h)^2$$

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

$$1 - 4 = a(1 - 4)^2$$

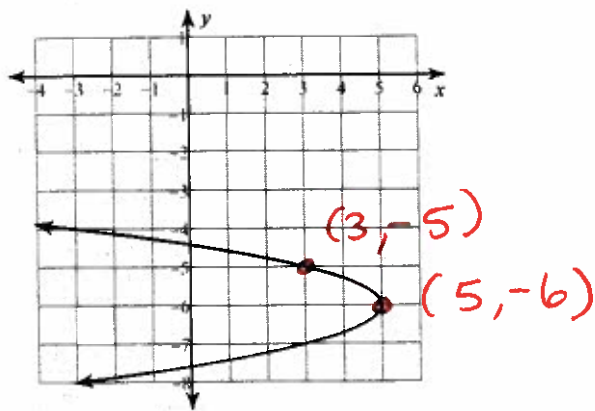
$$-3 = a(-3)^2$$

$$-3 = 9a$$

$$a = -\frac{1}{3}$$

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

4)



$$x - h = a(y - k)^2$$

$$x - 5 = a(y + 6)^2$$

$$3 - 5 = a(-5 + 6)^2$$

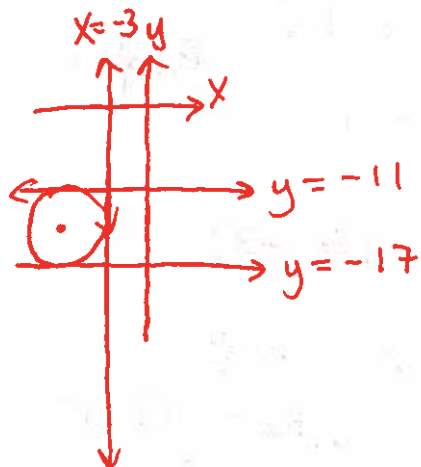
$$-2 = a$$

$$x - 5 = -2(y + 6)^2$$

Use the information provided to write the standard form equation of each circle.

5) Center lies in the third quadrant

Tangent to  $x = -3$ ,  $y = -17$ , and  $y = -11$



diameter = 6

so  $r = 3$

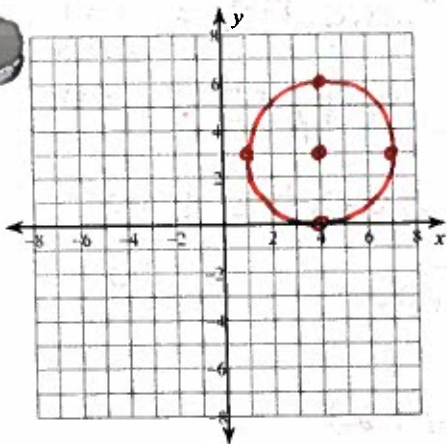
$y = -14$  of center

$x = -6$  of center

$$(x + 6)^2 + (y + 14)^2 = 9$$

Identify the center and radius of each. Then sketch the graph.

6)  $-6y + y^2 = 8x - x^2 - 16$



$$x^2 - 8x + 16 + y^2 - 6y + 9 = -16 + 25$$

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

$$C: (4, 3)$$

$$r = 3$$

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

7) Vertices:  $(5, 6), (5, -14)$

Foci:  $(5, 4), (5, -12)$

$$\frac{6 + (-14)}{2} = -4$$

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

$$C: (5, -4)$$

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

V:  $(5, 6)$  is 10 units away from center

$$a = 10, a^2 = 100$$

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

F:  $(5, 4)$  is 8 units away from center

$$8^2 = 100 - b^2$$

$$b^2 = 36$$

$$\text{Final: } \frac{(x-5)^2}{36} + \frac{(y+4)^2}{100} = 1$$

8)  $4y^2 + 3x^2 - 365 = 40y - 30x$

$$3x^2 + 30x + 75 + 4y^2 - 40y + 100 = 365 + 75$$

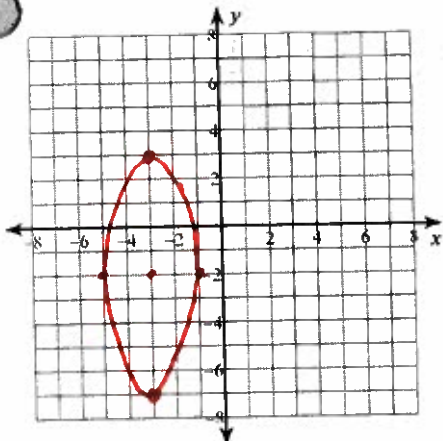
$$3(x^2 + 10x + 25) + 4(y^2 - 10y + 25) = 440$$

$$\frac{3(x+5)^2}{540} + \frac{4(y-5)^2}{540} = \frac{440}{540}$$

$$\frac{(x+5)^2}{180} + \frac{(y-5)^2}{135} = 1$$

Identify the center, vertices, co-vertices, foci, and eccentricity,  $\frac{c}{a}$  of each. Then sketch the graph.

9)  $150x + 25x^2 + 4y^2 + 141 = -16y$



$C: (-3, -2)$

$V: (-3, 3) \quad (-3, -7)$

$CO-V: (-1, -2) \quad (-5, -2)$

$c^2 = 25 - 4 = 21 \quad c = \sqrt{21}$

$$25x^2 + 150x + 225 + 4y^2 + 16y + 16 = -141 + 225 + 16$$

$$25(x^2 + 6x + 9) + 4(y^2 + 4y + 4) = 100$$

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

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

$Foci: (-3, -2 \pm \sqrt{21})$

$e = \frac{\sqrt{21}}{5}$

Use the information provided to write the vertex form equation of each parabola.

10) Focus:  $(6, \frac{15}{8})$ , Directrix:  $y = \frac{17}{8}$

↓ horizontal  
so  $y = x^2$

$$y - k = a(x - h)^2$$

$$\frac{15}{8} + \frac{17}{8} = \frac{32}{8} = 4 \quad 4 \div 2 = 2$$

$V: (6, 2)$

$$y - 2 = a(x - 6)^2$$

$P = \frac{1}{4a}$  or  $a = \frac{1}{4P} = \frac{1}{4(\frac{1}{8})} = \frac{1}{\frac{1}{2}} = 2$

$$y - 2 = 2(x - 6)^2$$

11) Focus:  $(\frac{71}{16}, 2)$ , Directrix:  $x = \frac{57}{16}$

↓ vertical  
so  $x = y^2$

$$x - h = a(y - k)^2$$

$$\frac{71}{16} - \frac{57}{16} = \frac{14}{16} \rightarrow 14 \div 2 = 7$$

$V: (7, 2)$

$$x - 7 = a(y - 2)^2$$

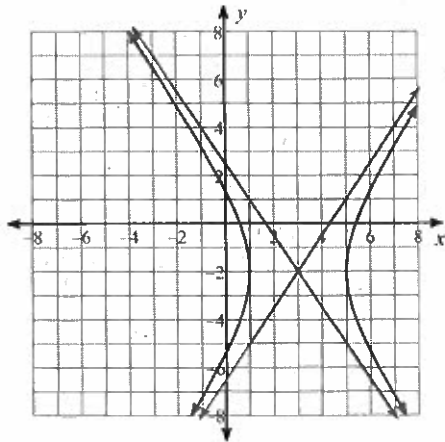
$$a = \frac{1}{4(\frac{7}{16})} = \frac{1}{\frac{7}{4}} = \frac{4}{7}$$

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

## Conic Sections- Hyperbolas and Systems Quiz

Identify the vertices, foci, and asymptotes of each. Then sketch the graph.

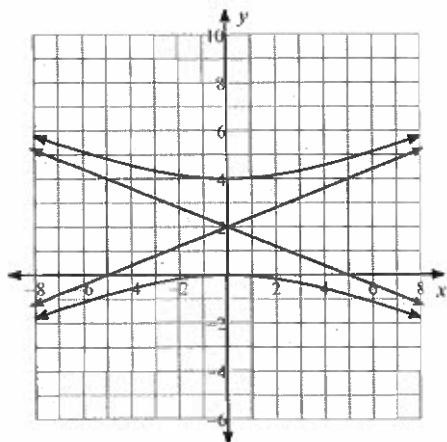
1)  $9x^2 - 4y^2 - 54x - 16y + 29 = 0$



Vertices:  $(5, -2)$   
 $(1, -2)$   
 Foci:  $(3 + \sqrt{13}, -2)$   
 $(3 - \sqrt{13}, -2)$   
 Asym.:  $y = \frac{3}{2}x - \frac{13}{2}$   
 $y = -\frac{3}{2}x + \frac{5}{2}$

Use the information provided to write the standard form equation of each hyperbola.

2)

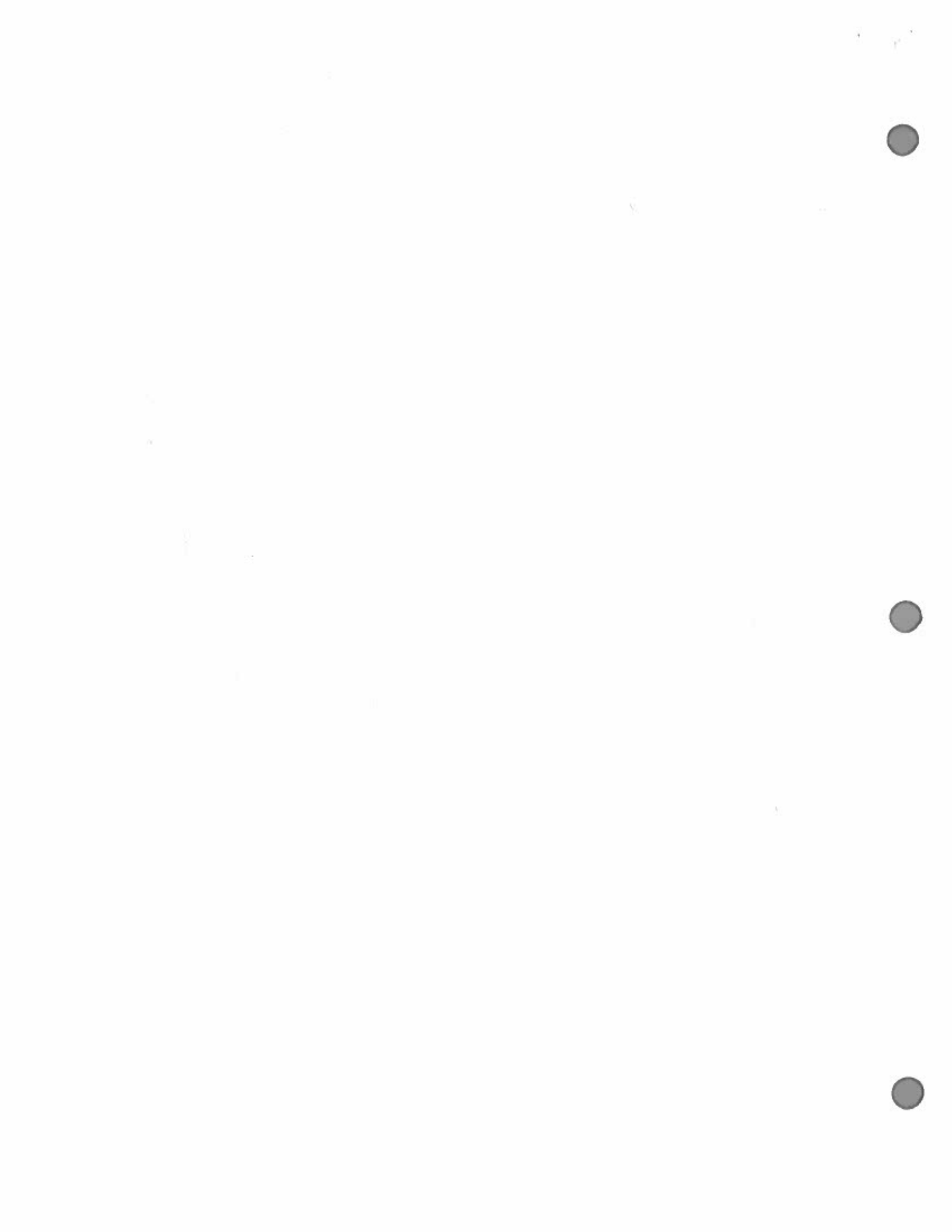


$$\frac{(y - 2)^2}{4} - \frac{x^2}{25} = 1$$

3) Center at  $(4, -8)$

Transverse axis is horizontal and 14 units long  
 Conjugate axis is 12 units long

$$\frac{(x - 4)^2}{49} - \frac{(y + 8)^2}{36} = 1$$



- 4) Vertices:  $(3, 7), (3, -17)$   
Foci:  $(3, 8), (3, -18)$

$$\frac{(y+5)^2}{144} - \frac{(x-3)^2}{25} = 1$$

**State if the point given is a solution to the system of equations.**

5)  $x^2 + y^2 + 4x - 36 = 0$

$$x - 3y + 2 = 0$$

Point:  $(-8, -2)$

Yes

**Solve each system of equations.**

6)  $x^2 - y^2 - 41x - y - 90 = 0$

$$3x - y = -2$$

$(-4, -10), (-3, -7)$

7)  $7x^2 + 7y^2 - 9x + 84y + 104 = 0$

$$27x^2 + 7y^2 + 11x + 84y - 136 = 0$$

$(-4, -6), (3, -2), (3, -10)$

