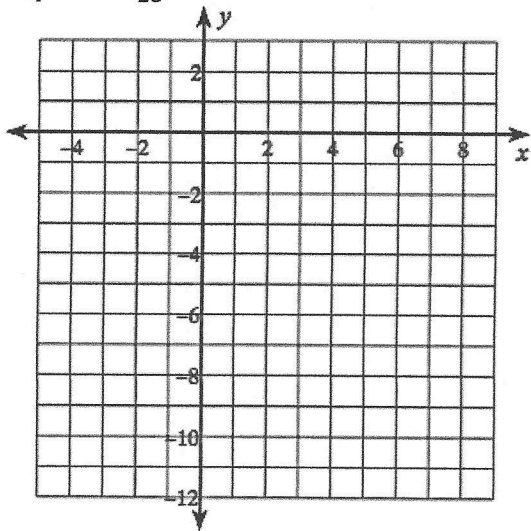


For each of the following, graph the conic section and identify all important information.

1-  $\frac{(x-3)^2}{4} + \frac{(y+7)^2}{25} = 1$

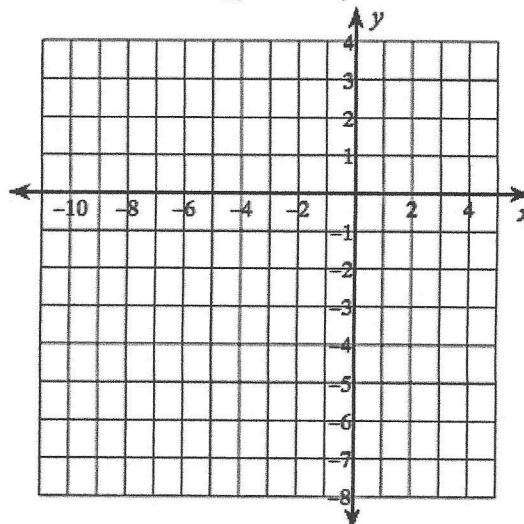


Direction: \_\_\_\_\_ Center: \_\_\_\_\_

Vert: \_\_\_\_\_ Co-Vert: \_\_\_\_\_

Foci: \_\_\_\_\_ Ecc.: \_\_\_\_\_ Area: \_\_\_\_\_

2-  $\frac{(x+6)^2}{16} - \frac{(y+3)^2}{9} = 1$

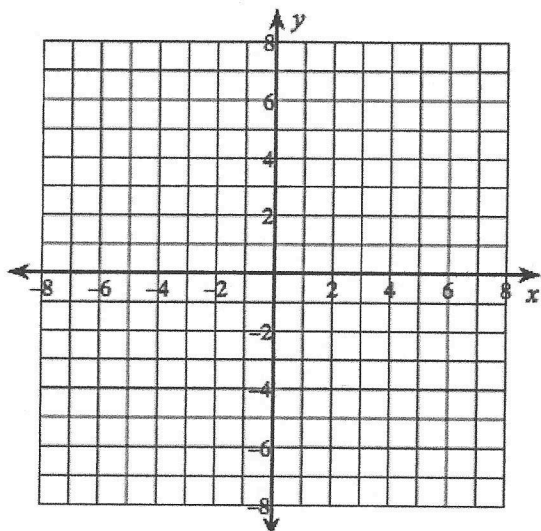


Direction: \_\_\_\_\_ Center: \_\_\_\_\_

Vertices: \_\_\_\_\_ Foci: \_\_\_\_\_

Ecc.: \_\_\_\_\_ Asymptotes: \_\_\_\_\_

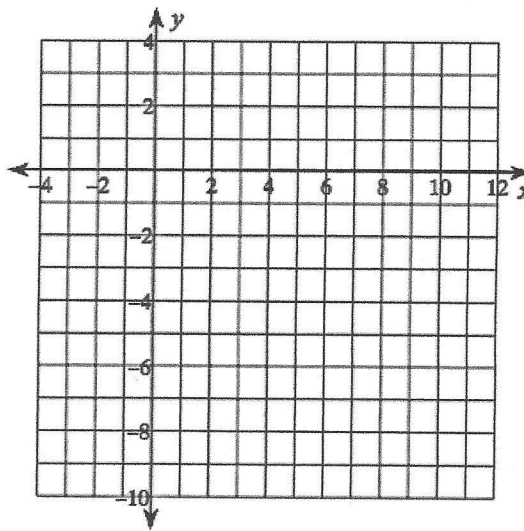
3-  $(x+3)^2 + (y-2)^2 = 16$



Center: \_\_\_\_\_ Radius: \_\_\_\_\_

Area: \_\_\_\_\_

4-  $(y+5)^2 = -8(x-7)$



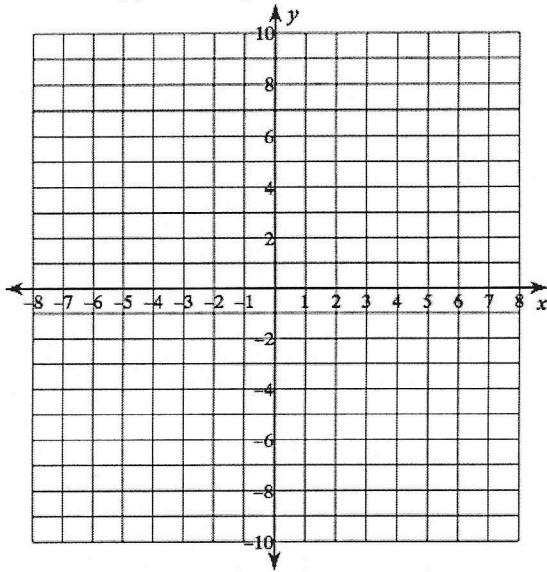
Direction: \_\_\_\_\_ Focal Diameter: \_\_\_\_\_

Vertex: \_\_\_\_\_ Focus: \_\_\_\_\_

Axis of Symmetry: \_\_\_\_\_ Directrix: \_\_\_\_\_

5-

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

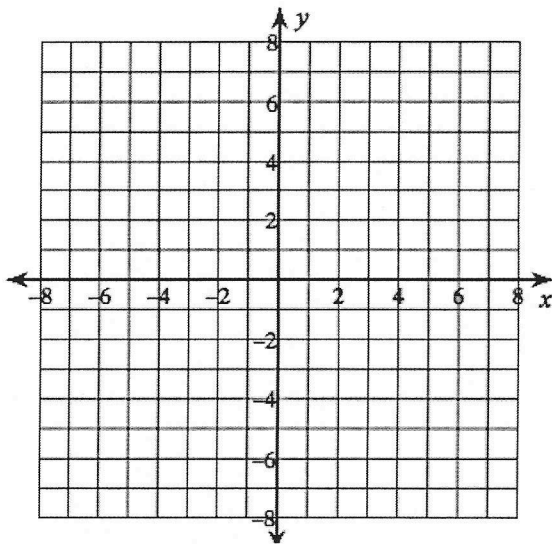


Direction: \_\_\_\_\_ Center: \_\_\_\_\_

Vertices: \_\_\_\_\_ Foci: \_\_\_\_\_

Ecc.: \_\_\_\_\_ Asymptotes: \_\_\_\_\_

7-  $-4x^2 - 9y^2 + 32x - 18y - 37 = 0$



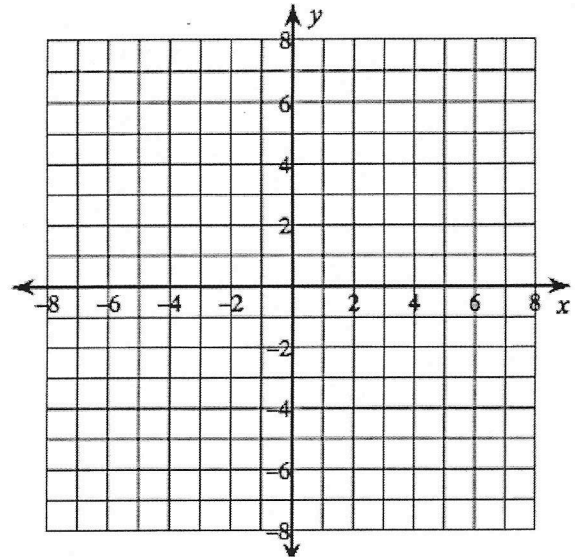
Direction: \_\_\_\_\_ Center: \_\_\_\_\_

Vert: \_\_\_\_\_ Co-Vert: \_\_\_\_\_

Foci: \_\_\_\_\_ Ecc.: \_\_\_\_\_ Area: \_\_\_\_\_

6-

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

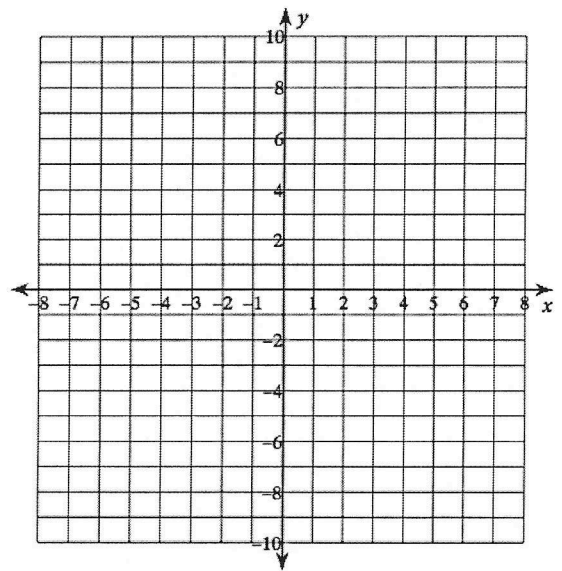


Direction: \_\_\_\_\_ Focal Diameter: \_\_\_\_\_

Vertex: \_\_\_\_\_ Focus: \_\_\_\_\_

Axis of Symmetry: \_\_\_\_\_ Directrix: \_\_\_\_\_

8-  $x^2 + 4x - 12y - 104 = 0$



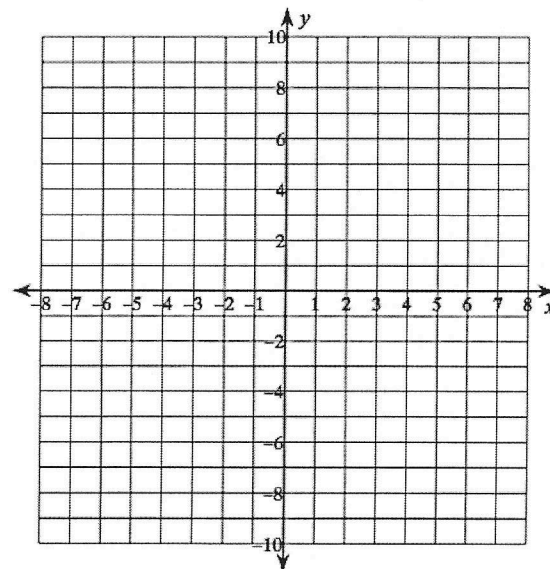
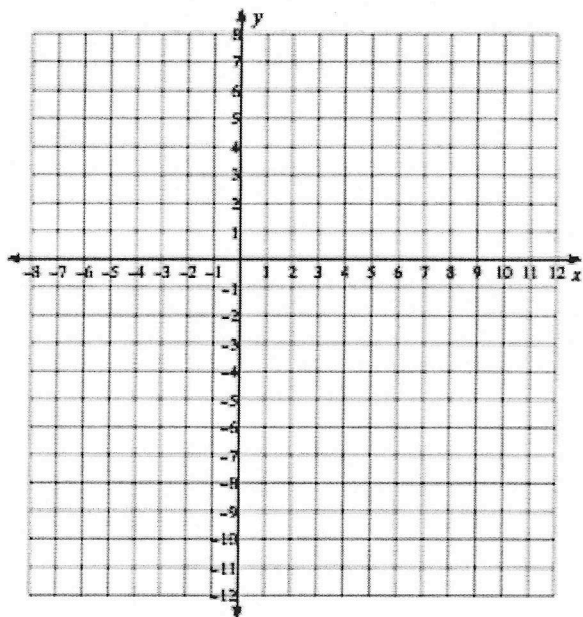
Direction: \_\_\_\_\_ Focal Diameter: \_\_\_\_\_

Vertex: \_\_\_\_\_ Focus: \_\_\_\_\_

Axis of Symmetry: \_\_\_\_\_ Directrix: \_\_\_\_\_

9-  $-36x^2 + 49y^2 + 144x + 294y - 1467 = 0$

10-  $-3x^2 - 3y^2 + 42x - 6y - 123 = 0$



Direction: \_\_\_\_\_ Center: \_\_\_\_\_

Center: \_\_\_\_\_ Radius: \_\_\_\_\_

Vertices: \_\_\_\_\_ Foci: \_\_\_\_\_

Area: \_\_\_\_\_

Ecc.: \_\_\_\_\_ Asymptotes: \_\_\_\_\_

For each of the following, identify as a circle, ellipse, parabola, or hyperbola.

11-  $x^2 + y^2 + 3x - 2y + 5 = 0$

12-  $3x^2 - 2xy - 4y^2 - 3x + 6y - 7 = 0$

13-  $x^2 + 14y - 30 = 0$

14-  $-10x^2 - 7y^2 + 20x - 21y - 4 = 0$

15-  $9x^2 - 12xy + 4y^2 - x + 2y + 1 = 0$

16-  $-6x^2 + 8y^2 - 9x + 12y + 1 = 0$

17-  $5x^2 + 3xy + 8y^2 - 5x + 2 = 0$

18-  $3x^2 + 10xy + 6y^2 - 30x - 12 = 0$

For each of the following, identify as a circle/ellipse, parabola, or hyperbola.  
Then determine the angle of rotation.

19.  $x^2 - xy + y^2 + 2x - 3y - 9 = 0$

20.  $3x^2 + 2\sqrt{3}xy - y^2 + x - 7y + 2 = 0$

21.  $5x^2 + 3xy + 9y^2 - x + 2y = 0$

22.  $5x^2 - xy + 4y^2 - 7 = 0$

23.  $7\sqrt{3}x^2 + 2xy + 5\sqrt{3}y^2 - x + 4 = 0$

24.  $7x^2 - 45xy - 71y^2 + 8x - 7y + 3 = 0$

25. Use the information provided to write the standard form equation of each hyperbola.  
Vertices:  $(4, 11)$ ,  $(4, -1)$   
Endpoints of the Conjugate Axis:  $(16, 5)$ ,  $(-8, 5)$

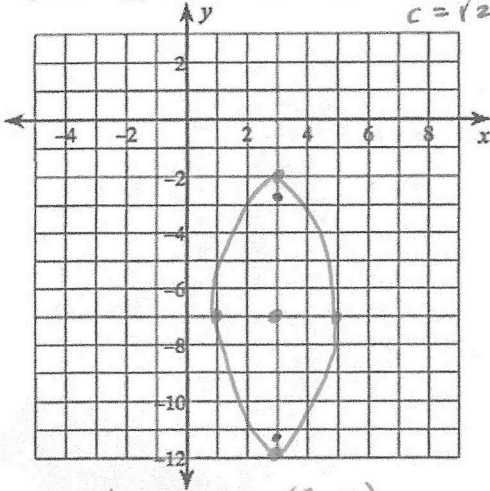
26. Use the information provided to write the standard form equation of each hyperbola.  
Vertices:  $(-3, 4)$ ,  $(-3, -16)$   
Asymptotes:  $y = \pm 2(x + 3) - 6$

27. Use the information provided to write the standard form equation of each ellipse.  
Vertices:  $(-9, 19)$ ,  $(-9, -3)$   
Co-Vertices:  $(-7, 8)$ ,  $(-11, 8)$

28. Use the information provided to write the standard form equation of each ellipse.  
Foci:  $(-1 \pm 2\sqrt{15}, -8)$   
Endpoints of the Conjugate Axis:  $(13, -8)$ ,  $(-15, -8)$

For each of the following, graph the conic section and identify all important information.

1-  $\frac{(x-3)^2}{4} + \frac{(y+7)^2}{25} = 1$   $c^2 = 25 - 4$   
 $c = \sqrt{21}$

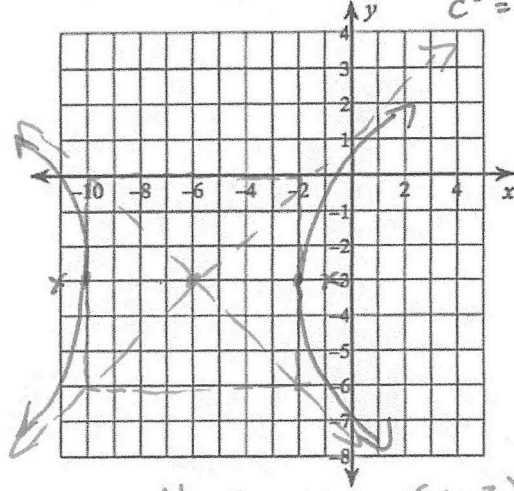


Direction: Vert. Center: (3, -7)

Vert: (3, -2) Co-Vert: (1, -7) (5, -7)  
(3, -12)

Foci: (3, -7 + \sqrt{21}) Ecc.: \frac{\sqrt{21}}{5} Area: \frac{\pi(2)(5)}{= 10\pi u^2}  
(3, -7 - \sqrt{21})

2-  $\frac{(x+6)^2}{16} - \frac{(y+3)^2}{9} = 1$   $c^2 = 16 + 9$   
 $c = 5$

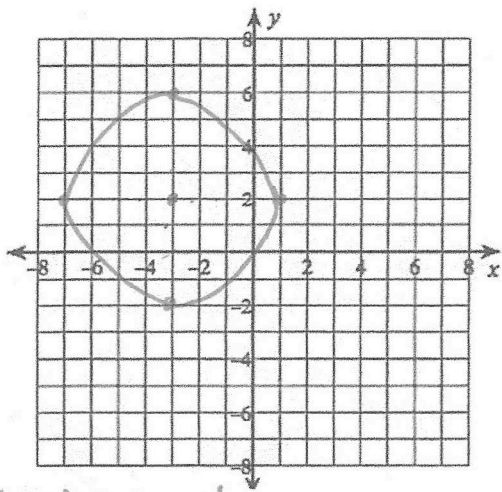


Direction: Horiz. Center: (-6, -3)

Vertices: (-2, -3) (-10, -3) Foci: (-1, -3) (-11, -3)

Ecc.: \frac{5}{4} Asymptotes: y = \pm \frac{3}{4}(x+6) - 3

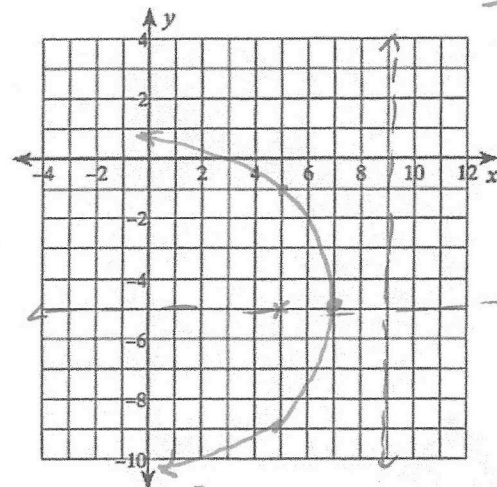
3-  $(x+3)^2 + (y-2)^2 = 16$



Center: (-3, 2) Radius: 4

Area: 16\pi u^2

4-  $(y+5)^2 = -8(x-7)$



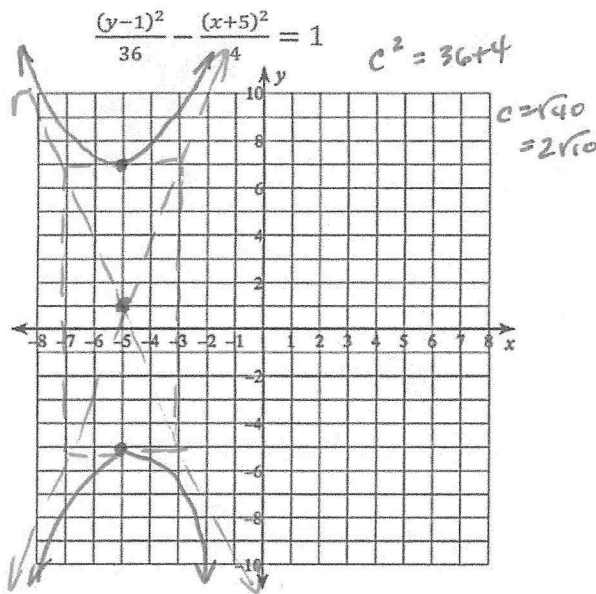
Direction: Left Focal Diameter: 8

Vertex: (7, -5) Focus: (5, -5)

Axis of Symmetry: y = -5 Directrix: x = 9

$-8 = 4p$   
 $p = -2$

5-

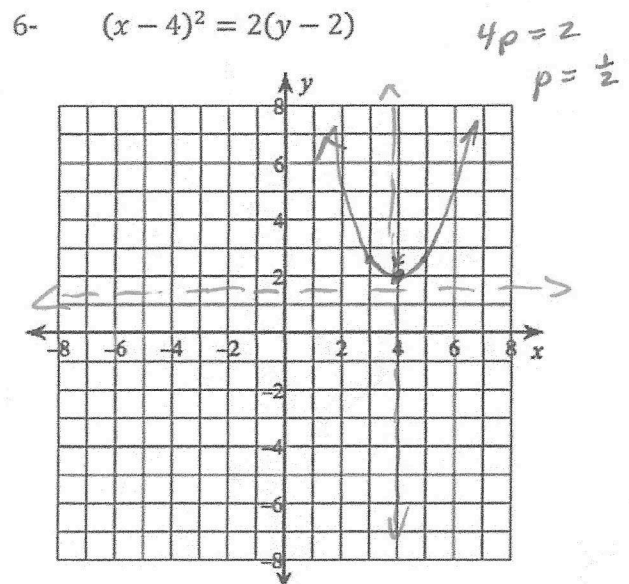


Direction: Vertical Center:  $(-5, 1)$

Vertices:  $(-5, 7), (-5, -5)$  Foci:  $(-5, 1+2\sqrt{10}), (-5, 1-2\sqrt{10})$

Ecc.:  $\frac{2\sqrt{10}}{6} = \frac{\sqrt{10}}{3}$  Asymptotes:  $y = \pm 3(x+5) + 1$

6-



Direction: UP Focal Diameter: 2

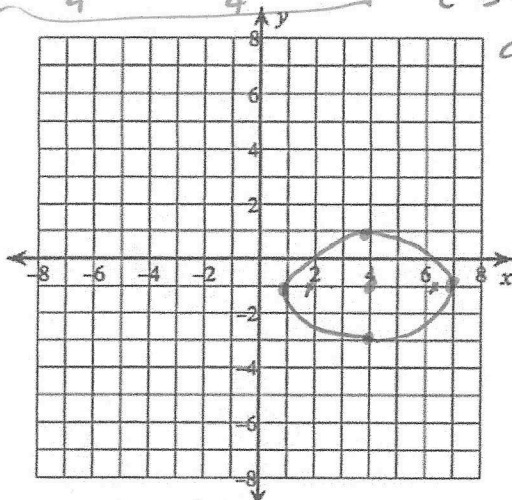
Vertex:  $(4, 2)$  Focus:  $(4, \frac{5}{2})$

Axis of Symmetry:  $x = 4$  Directrix:  $y = \frac{3}{2}$

7-  $-4x^2 - 9y^2 + 32x - 18y - 37 = 0$

$-4x^2 + 32x - 9y^2 - 18y = 37$   
 $-4(x^2 - 8x + 16) - 9(y^2 + 2y + 1) = 37 - 64 - 9$   
 $-4(x-4)^2 - 9(y+1)^2 = -36$

$\frac{(x-4)^2}{9} + \frac{(y+1)^2}{4} = 1$   $c^2 = 9+4$   
 $c = \sqrt{13}$



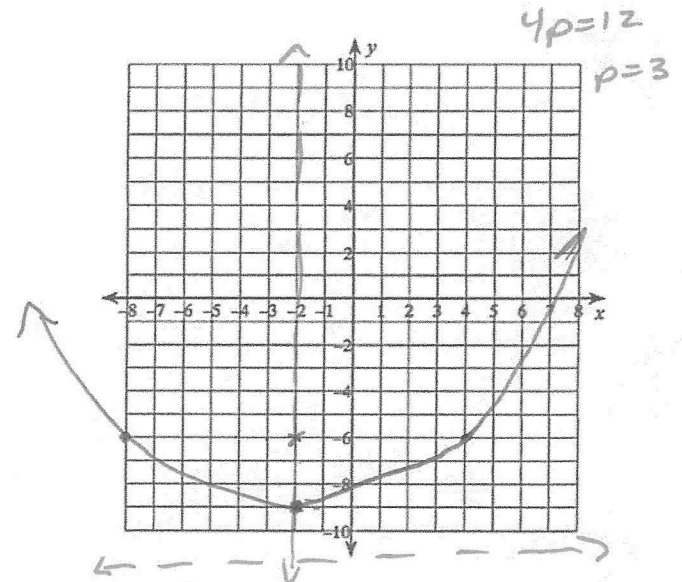
Direction: Horizontal Center:  $(4, -1)$

Vert:  $(1, -1), (7, -1)$  Co-Vert:  $(4, 1), (4, -3)$

Foci:  $(4+\sqrt{13}, -1), (4-\sqrt{13}, -1)$  Ecc.:  $\frac{\sqrt{13}}{3}$  Area:  $\frac{\pi(3)(2)}{6\pi a^2}$

8-  $x^2 + 4x - 12y - 104 = 0$

$x^2 + 4x = 12y + 104 + 4$   
 $x^2 + 4x + 4 = 12y + 108$   
 $(x+2)^2 = 12(y+9)$



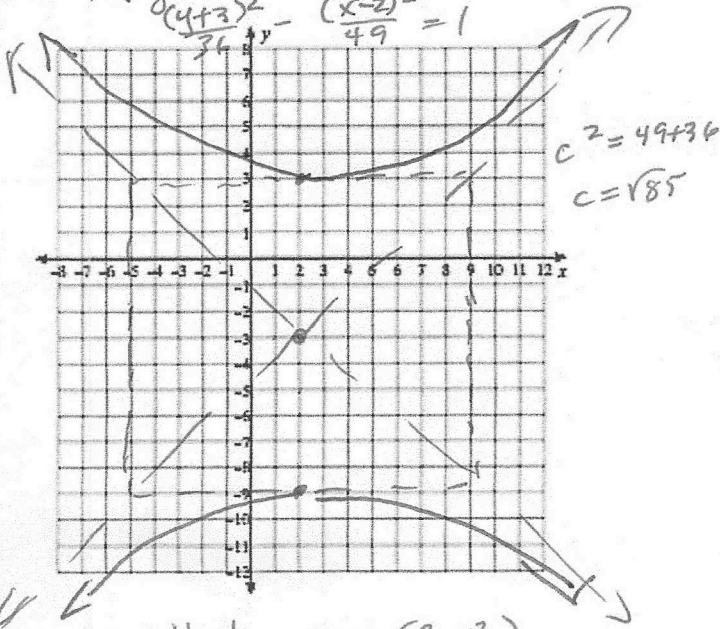
Direction: UP Focal Diameter: 12

Vertex:  $(-2, -9)$  Focus:  $(-2, -6)$

Axis of Symmetry:  $x = -2$  Directrix:  $y = -12$

9.  $-36x^2 + 49y^2 + 144x + 294y - 1467 = 0$

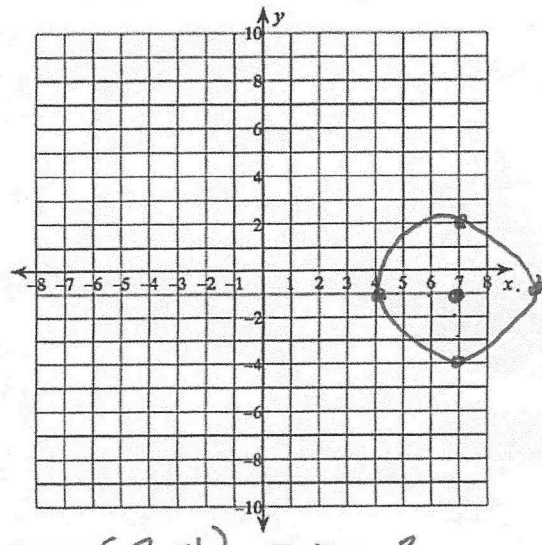
$49y^2 + 294y - 36x^2 + 144x = 1467$   
 $49(y^2 + 6y + 9) - 36(x^2 - 4x + 4) = 1467 - 441 + 144$   
 $49(y+3)^2 - 36(x-2)^2 = 1764$   
 $\frac{(y+3)^2}{36} - \frac{(x-2)^2}{49} = 1$



Direction: Vert. Center:  $(2, -3)$   
 Vertices:  $(2, 3)$   $(2, -9)$  Foci:  $(2, -3 \pm \sqrt{85})$   
 Ecc.:  $\frac{\sqrt{85}}{6}$  Asymptotes:  $y = \pm \frac{6}{7}(x-2) - 3$

10.  $-3x^2 - 3y^2 + 42x - 6y - 123 = 0$

$-3x^2 + 42x - 3y^2 - 6y = 123$   
 $-3(x^2 - 14x + 49) - 3(y^2 + 2y + 1) = 123 - 147 - 3$   
 $-3(x-7)^2 - 3(y+1)^2 = -27$   
 $(x-7)^2 + (y+1)^2 = 9$



Center:  $(7, -1)$  Radius: 3  
 Area:  $9\pi u^2$

For each of the following, identify as a circle, ellipse, parabola, or hyperbola.

11.  $x^2 + y^2 + 3x - 2y + 5 = 0$   
 $AC = 1(1) > 0 \quad A=C$   
Circle

12.  $3x^2 - 2xy - 4y^2 - 3x + 6y - 7 = 0$   
 $B^2 - 4AC$   
 $(-2)^2 - 4(3)(-4) > 0$   
Hyperbola

13.  $x^2 + 14y - 30 = 0$   
 $AC = (1)(0) = 0$   
Parabola

14.  $-10x^2 - 7y^2 + 20x - 21y - 4 = 0$   
 $AC = (-10)(-7) > 0 \quad A \neq C$   
Ellipse

15.  $9x^2 - 12xy + 4y^2 - x + 2y + 1 = 0$   
 $(-12)^2 - 4(9)(4) = 0$   
Parabola

16.  $-6x^2 + 8y^2 - 9x + 12y + 1 = 0$   
 $AC = -6(8) < 0$   
Hyperbola

17.  $5x^2 + 3xy + 8y^2 - 5x + 2 = 0$   
 $B^2 - 4AC$   
 $3^2 - 4(5)(8) < 0$   
Circle/Ellipse

18.  $3x^2 + 10xy + 6y^2 - 30x - 12 = 0$   
 $B^2 - 4AC$   
 $10^2 - 4(3)(6) > 0$   
Hyperbola

$$\tan 2\theta = \frac{B}{A-C} / \cot 2\theta = \frac{A-C}{B}$$

For each of the following, identify as a circle/ellipse, parabola, or hyperbola. Then determine the angle of rotation.

$$B^2 - 4AC$$

19.  $x^2 - xy + y^2 + 2x - 3y - 9 = 0$

$$(-1)^2 - 4(1)(1) < 0 \quad \text{E/C}$$

$$\cot 2\theta = \frac{1-1}{-1} = 0$$

$$2\theta = 90^\circ \text{ or } \pi/2$$

$$\theta = 45^\circ \text{ or } \frac{\pi}{4}$$

20.  $3x^2 + 2\sqrt{3}xy - y^2 + x - 7y + 2 = 0$

$$(2\sqrt{3})^2 - 4(3)(-1) > 0 \quad \text{H}$$

$$\tan 2\theta = \frac{2\sqrt{3}}{3-(-1)} = \frac{\sqrt{3}}{2}$$

$$2\theta = 40.89^\circ$$

$$\theta \approx 20.45^\circ$$

21.  $5x^2 + 3xy + 9y^2 - x + 2y = 0$

$$(3)^2 - 4(5)(9) < 0 \quad \text{E/C}$$

$$\tan 2\theta = \frac{3}{5-9} = -\frac{3}{4}$$

$$2\theta \approx -36.87^\circ$$

$$\theta \approx -18.43^\circ$$

22.  $5x^2 - xy + 4y^2 - 7 = 0$

$$(-1)^2 - 4(5)(4) < 0 \quad \text{E/C}$$

$$\tan 2\theta = \frac{-1}{5-4} = -1$$

$$2\theta = -\frac{\pi}{4}$$

$$\theta = -\frac{\pi}{8} \text{ or } -22.5^\circ$$

23.  $7\sqrt{3}x^2 + 2xy + 5\sqrt{3}y^2 - x + 4 = 0$

$$(2)^2 - 4(7\sqrt{3})(5\sqrt{3}) < 0 \quad \text{E/C}$$

$$\tan 2\theta = \frac{2}{5\sqrt{3}-5\sqrt{3}} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

$$2\theta = \pi/6$$

$$\theta = \frac{\pi}{12} \text{ or } 15^\circ$$

24.  $7x^2 - 45xy - 71y^2 + 8x - 7y + 3 = 0$

$$\tan 2\theta = \frac{-45}{7-71} = \frac{-45}{78}$$

$$2\theta \approx -29.98^\circ$$

$$\theta \approx -14.99^\circ$$

$$(45)^2 - 4(7)(-71) > 0$$

$$\text{H}$$

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

Vertices: (4, 11), (4, -1)

Endpoints of the Conjugate Axis: (16, 5), (-8, 5)

$$(h, k) = (4, 5)$$

$$2a = 12$$

$$a = 6$$

$$2b = 24$$

$$b = 12$$

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

$$\frac{(y-5)^2}{36} - \frac{(x-4)^2}{144} = 1$$

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

Vertices: (-3, 4), (-3, -16)

Asymptotes:  $y = \pm 2(x + 3) - 6$

$$(h, k) = (-3, -6)$$

$$2a = 20$$

$$a = 10$$

$$\frac{2}{1} = \frac{a}{b} = \frac{10}{b}$$

$$b = 5$$

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

$$\frac{(y+6)^2}{100} - \frac{(x+3)^2}{25} = 1$$

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

Vertices: (-9, 19), (-9, -3)

Co-Vertices: (-7, 8), (-11, 8)

$$(h, k) = (-9, 8)$$

$$2a = 22$$

$$a = 11$$

$$2b = 4$$

$$b = 2$$

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

$$\frac{(x+9)^2}{4} + \frac{(y-8)^2}{121} = 1$$

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

Foci:  $(-1 \pm 2\sqrt{15}, -8)$

Endpoints of the Conjugate Axis: (13, -8), (-15, -8)

$$(h, k) = (-1, -8)$$

$$2b = 28$$

$$b = 14$$

$$c = 2\sqrt{15}$$

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

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

$$\frac{(x+1)^2}{256} + \frac{(y+8)^2}{196} = 1$$

$$(2\sqrt{15})^2 = a^2 - 14^2$$

$$256 = a^2$$