

Name: key Per: _____ Date: _____
 Serafino • Precalculus 52

10B**Ellipses & Circles****Critical Info, Graphing & Writing Equations**

In this packet, we're going to tackle Circles & Ellipses separately, highlighting each of the skills you'll be expected to do with each. I highly recommend doing the ODD problems from here, for practice while the sub is in. Then, you can do the EVENS if you got all the odds wrong and need more, or if you want to practice each skill before the test. For each conic, you will be expected to do the following...

CIRCLES:

- Pg 1 Part 1: State center, radius and domain & range from an equation (including general form)
 Pg 2 Part 2: Draw an accurate sketch of a circle (with 4 points) and center, stating domain & range
 Pg 2-3 Part 3: Write the equation of a circle, given critical info, a graph or general form.

ELLIPSES:

- Pg 4 Part 1: State direction, center, vertices, co-vertices, foci, major and minor axis length, domain & range
 Pg 5 Part 2: Sketch the ellipse, including vertices, co-vertices and foci
 Pg 6-7 Part 3: Write the equation of an ellipse, given critical info or a graph
 Pg 8 Extra Credit Opportunity: Completing the square with Ellipses

CIRCLES

CIRCLES PART 1: State the critical info: find a) the center b) radius. *Complete the square first, if necessary.*

1) $x^2 + y^2 = 49$

C: (0, 0) r = 7

2) $x^2 + y^2 = 324$

C = (0, 0) r = 18

3) $(x+2)^2 + (y-3)^2 = 183$

C (-2, 3) r = $\sqrt{183}$

4) $(x+7)^2 + (y+8)^2 = 64$

C = (-7, -8) r = 8

5) $(x+10)^2 + (y+9)^2 = 36$

C: (-10, -9) r = 6

6) $(x+5)^2 + (y-10)^2 = 9$

C: (-5, 10) r = 3

7) $x^2 + (y+2)^2 = 121$

C: (0, -2) r = 11

8) $(x-14)^2 + (y-2)^2 = 4$

C (14, 2) r = 2

9) $364 + 28y + y^2 + x^2 = -26x$

C: (-13, -14) r = 1

10) $x^2 + y^2 + 24x + 10y + 160 = 0$

C (-12, -5), r = 3

11) $-6x = -x^2 + 32y - 264 - y^2$

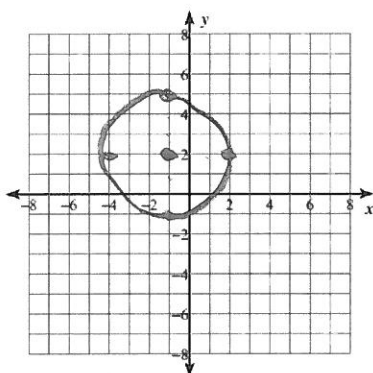
C: (3, 6) r = 1

12) $-6x + x^2 = 97 + 10y - y^2$

C (3, 5), r = $\sqrt{13}$

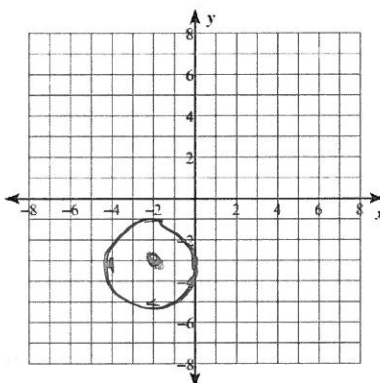
CIRCLES PART 2: For each of the following a) graph accurately and b) state domain & range

13) $(x+1)^2 + (y-2)^2 = 9$



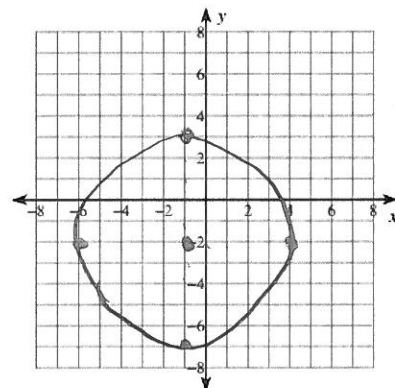
D: $x \in [-4, 2]$
R: $y \in [-1, 5]$

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



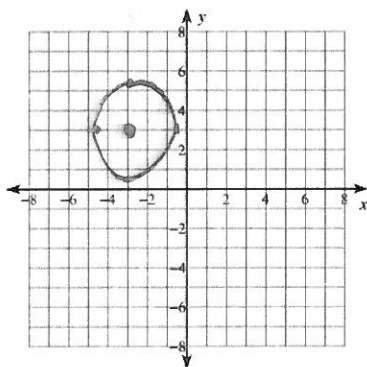
$x \in [-4, 0]$ $y \in [-5, -1]$

15) $(x+1)^2 + (y+2)^2 = 25$



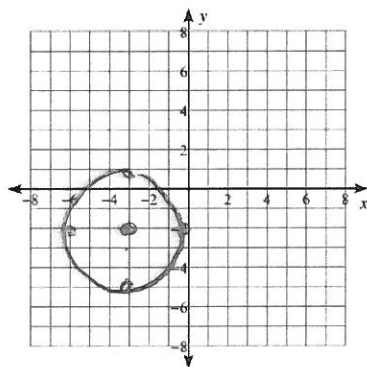
$x \in [-6, 4]$ $y \in [-7, 3]$

16) $(x+3)^2 + (y-3)^2 = 8$



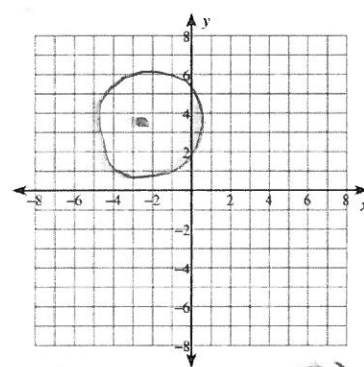
$x \in [-3-2\sqrt{2}, -3+2\sqrt{2}]$
 $y \in [3-2\sqrt{2}, 3+2\sqrt{2}]$

17) $(x+3)^2 + (y+2)^2 = 9$



$x \in [-6, 0]$
 $y \in [-5, 1]$

18) $(x+\frac{5}{2})^2 + (y-\sqrt{14})^2 = 9$



Center: $(-5/2, \sqrt{14})$ $r = 3$
 $x \in [-11/2, 1/2]$
 $y \in [\sqrt{14}-3, \sqrt{14}+3]$

CIRCLES PART 3: Writing Equations of Circles in Standard Form

1) $8x + x^2 - 2y = 64 - y^2$

$$(x+4)^2 + (y-1)^2 = 8$$

3) $x^2 + y^2 + 14x - 12y + 4 = 0$

$$(x+7)^2 + (y-6)^2 = 81$$

5) $x^2 + 2x + y^2 = 55 + 10y$

$$(x+1)^2 + (y-5)^2 = 81$$

7) Center: $(-11, -8)$
Radius: 4

$$(x+11)^2 + (y+8)^2 = 16$$

2) $137 + 6y = -y^2 - x^2 - 24x$

$$(x+12)^2 + (y+3)^2 = 16$$

4) $y^2 + 2x + x^2 = 24y - 120$

$$(x+1)^2 + (y-12)^2 = 25$$

6) $8x + 32y + y^2 = -263 - x^2$

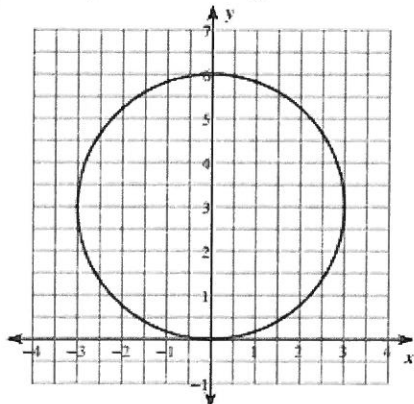
$$(x+4)^2 + (y+16)^2 = 9$$

8) Center: $(-6, -15)$
Radius: $\sqrt{5}$

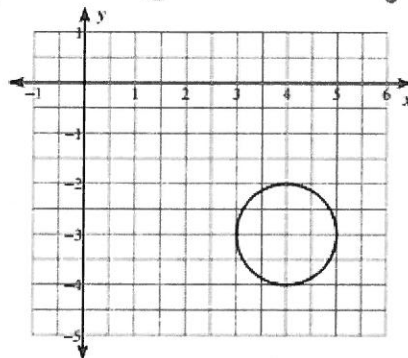
$$(x+6)^2 + (y+15)^2 = 5$$

CIRCLES PART 3: ... continued

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



12) $(x-4)^2 + (y+3)^2 = 1$



13) Ends of a diameter: $(-17, -9)$ and $(-19, -9)$

$$(x+18)^2 + (y+9)^2 = 1$$

15) Center: $(-15, 3\sqrt{7})$

Area: 2π

$$(x+15)^2 + (y-3\sqrt{7})^2 = 2$$

17) Center: $(-5, 12)$

Circumference: 8π

$$(x+5)^2 + (y-12)^2 = 16$$

19) Center: $(2, -5)$

Point on Circle: $(-7, -1)$

$$(x-2)^2 + (y+5)^2 = 97$$

21) Center: $(-15, 9)$

Tangent to $x = -17$

$$(x+15)^2 + (y-9)^2 = 4$$

23) Center lies on the x-axis

Tangent to $x = 7$ and $x = -13$

$$(x+3)^2 + y^2 = 100$$

14) Ends of a diameter: $(-3, 11)$ and $(3, -13)$

$$x^2 + (y+1)^2 = 153$$

16) Center: $(-11, -14)$

Area: 16π

$$(x+11)^2 + (y+14)^2 = 16$$

18) Center: $(15, 14)$

Circumference: $2\pi\sqrt{15}$

$$(x-15)^2 + (y-14)^2 = 15$$

20) Center: $(14, 17)$

Point on Circle: $(15, 17)$

$$(x-14)^2 + (y-17)^2 = 1$$

22) Center: $(-2, 12)$

Tangent to $x = -5$

$$(x+2)^2 + (y-12)^2 = 9$$

24) Center lies in the fourth quadrant

Tangent to $x = 7$, $y = -4$, and $x = 17$

$$(x-12)^2 + (y+9)^2 = 25$$

ELLIPSES

C V CV F Maj Min

ELLIPSES PART 1: State direction, center, vertices, co-vertices, foci, major and minor axis length, domain & range

$$1) \frac{x^2}{49} + \frac{y^2}{169} = 1 \quad \begin{array}{l} D: x \in [-7, 7] \\ R: y \in [-13, 13] \end{array}$$

Vertical C(0,0)

V: (0,13) (0,-13)

CV: (7,0) (-7,0)

F: (0, 2√30), (0, -2√30)

Maj: 26 Min: 14

$$3) \frac{x^2}{95} + \frac{y^2}{30} = 1 \quad \begin{array}{l} x \in [-\sqrt{95}, \sqrt{95}] \\ y \in [-\sqrt{30}, \sqrt{30}] \end{array}$$

Horizontal C(0,0)

V: (√95, 0) (-√95, 0)

CV: (0, √30) (0, -√30)

F: (√65, 0) (-√65, 0)

Maj: 2√95 Min: 2√30

$$5) \frac{x^2}{64} + \frac{(y-6)^2}{121} = 1 \quad \begin{array}{l} x \in [-8, 8] \\ y \in [-5, 17] \end{array}$$

Vertical C(0,6)

V: (0,17) (0,-5)

CV: (8,6) (-8,6)

F: (0, 6+√57), (0, 6-√57)

Maj: 22 Min: 16

$$7) \frac{(x-3)^2}{49} + \frac{(y-9)^2}{4} = 1$$

Horizontal C(3,9)

V: (10,9) (-4,9)

CV: (3,11) (3,7)

F: (3+3√5, 9) (3-3√5, 9)

Maj: 14 Min: 4

x ∈ [-4, 10] y ∈ [7, 11]

$$2) \frac{x^2}{36} + \frac{y^2}{16} = 1 \quad \begin{array}{l} D: x \in [-6, 6] \\ R: y \in [-4, 4] \end{array}$$

Horizontal C(0,0)

V: (6,0) (-6,0)

CV: (0,4) (0,-4)

F: (2√5, 0) (-2√5, 0)

Maj: 12 Min: 8

$$4) \frac{x^2}{169} + \frac{y^2}{64} = 1 \quad x \in [-13, 13] \quad y \in [-8, 8]$$

Horizontal C(0,0)

V: (13,0) (-13,0)

CV: (0,8) (0,-8)

F: (√105, 0) (-√105, 0)

Maj: 26 Min: 16

$$6) \frac{(x+5)^2}{81} + \frac{(y-1)^2}{144} = 1 \quad \begin{array}{l} x \in [-14, 4] \\ y \in [-11, 13] \end{array}$$

Vertical C(-5,1)

V: (-5,13) (-5,-11)

CV: (4,1) (-14,1)

F: (-5, 1+3√7) (-5, 1-3√7)

Maj: 24 Min: 18

$$8) \frac{x^2}{64} + \frac{(y-8)^2}{9} = 1$$

Horizontal C(0,8)

V: (8,8) (-8,8)

CV: (0,11) (0,5)

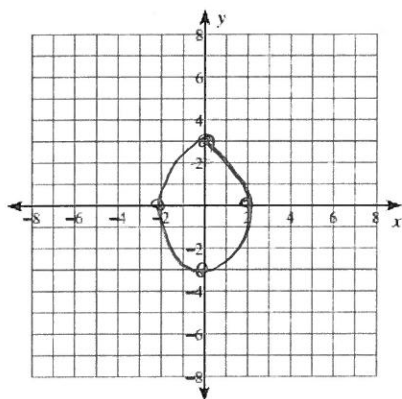
F: (√55, 8) (-√55, 8)

Maj: 16 Min: 6

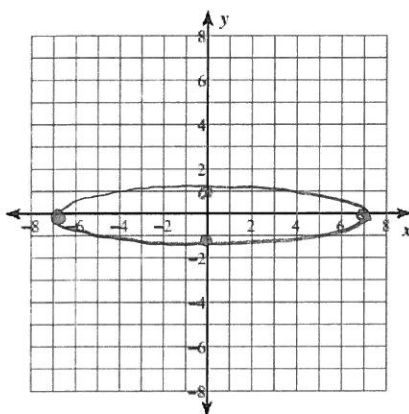
x ∈ [-8, 8] y ∈ [5, 11]

ELLIPSES PART 2: Graph the ellipse, including vertices, co-vertices and foci.

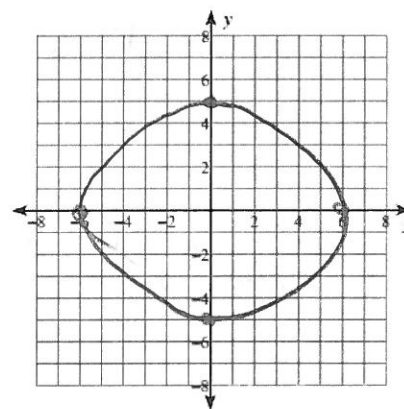
$$9) \frac{x^2}{4} + \frac{y^2}{9} = 1$$



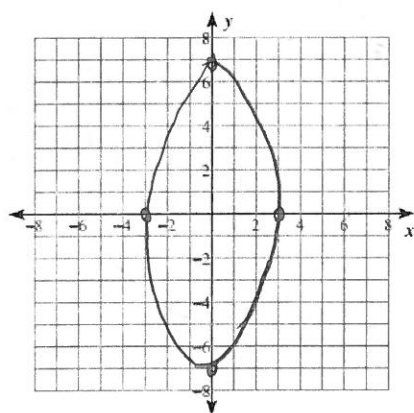
$$10) \frac{x^2}{49} + y^2 = 1$$



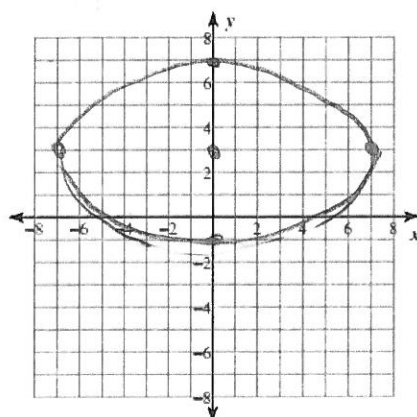
$$11) \frac{x^2}{36} + \frac{y^2}{25} = 1$$



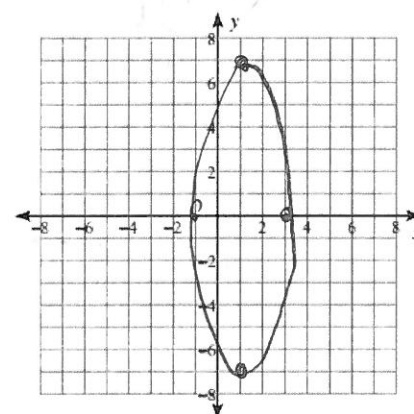
$$12) \frac{x^2}{9} + \frac{y^2}{49} = 1$$



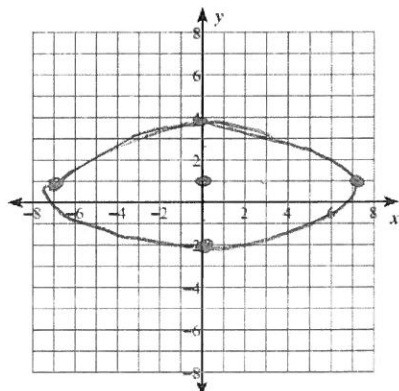
$$13) \frac{x^2}{49} + \frac{(y-3)^2}{16} = 1$$



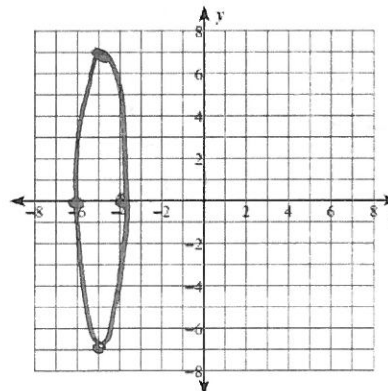
$$14) \frac{(x-1)^2}{4} + \frac{y^2}{49} = 1$$



$$15) \frac{x^2}{49} + \frac{(y-1)^2}{9} = 1$$



$$16) (x+5)^2 + \frac{y^2}{49} = 1$$



ELLIPSES PART 3: Write the equation of the ellipse in standard form, given the following properties

- 1) Vertices: (10, 0), (-10, 0)
Co-vertices: (0, 9), (0, -9)

$$\frac{x^2}{100} + \frac{y^2}{81} = 1$$

- 3) Vertices: (12, 0), (-12, 0)
Foci: (2√11, 0), (-2√11, 0)

$$\frac{x^2}{144} + \frac{y^2}{100} = 1$$

- 5) Foci: (-7, 5 + √13), (-7, 5 - √13)
Co-vertices: (-1, 5), (-13, 5)

$$\frac{(x+7)^2}{36} + \frac{(y-5)^2}{49} = 1$$

- 7) Foci: (√17, 0), (-√17, 0)
Endpoints of major axis: (9, 0), (-9, 0)

$$\frac{x^2}{81} + \frac{y^2}{64} = 1$$

- 9) Foci: (7 + 2√35, -4), (7 - 2√35, -4)
Endpoints of minor axis: (7, -2), (7, -6)

$$\frac{(x-7)^2}{144} + \frac{(y+4)^2}{4} = 1$$

- 11) Center: (6, -5)
Vertex: (6, 7)
Focus: (6, -5 - 6√3)

$$\frac{(x-6)^2}{36} + \frac{(y+5)^2}{144} = 1$$

- 13) Center: (4, 8)
Vertex: (4, 8 - √170)
Co-vertex: (4 - √15, 8)

$$\frac{(x-4)^2}{15} + \frac{(y-8)^2}{170} = 1$$

- 2) Vertices: (0, 6), (0, -6)
Co-vertices: (5, 0), (-5, 0)

$$\frac{x^2}{25} + \frac{y^2}{36} = 1$$

- 4) Vertices: (14, 0), (-14, 0)
Foci: (3√19, 0), (-3√19, 0)

$$\frac{x^2}{196} + \frac{y^2}{25} = 1$$

- 6) Foci: (7, 9), (-1, 9)
Co-vertices: (3, 12), (3, 6)

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

- 8) Foci: (√115, 0), (-√115, 0)
Endpoints of major axis: (√195, 0), (-√195, 0)

$$\frac{x^2}{195} + \frac{y^2}{80} = 1$$

- 10) Foci: (-5, 7 + √115), (-5, 7 - √115)
Endpoints of minor axis: (4, 7), (-14, 7)

$$\frac{(x+5)^2}{81} + \frac{(y-7)^2}{196} = 1$$

- 12) Center: (-3, -4)
Vertex: (6, -4)
Focus: (-3 - √65, -4)

$$\frac{(x+3)^2}{81} + \frac{(y+4)^2}{16} = 1$$

- 14) Center: (7, -10)
Vertex: (-6, -10)
Co-vertex: (7, -17)

$$\frac{(x-7)^2}{169} + \frac{(y+10)^2}{49} = 1$$

- 15) Center: $(-3, 3)$
Vertex: $(-10, 3)$
 $c^2 = 33$

$$\frac{(x+3)^2}{49} + \frac{(y-3)^2}{16} = 1$$

- 16) Center: $(1, -7)$
Vertex: $(1, 1)$
 $c^2 = 55$

$$\frac{(x-1)^2}{9} + \frac{(y+7)^2}{64} = 1$$

- 17) Center: $(-9, 5)$
Focus: $(-9 + 2\sqrt{14}, 5)$
Co-vertex: $(-9, 10)$

$$\frac{(x+9)^2}{81} + \frac{(y-5)^2}{25} = 1$$

- 18) Center: $(6, -4)$
Focus: $(6 + 2\sqrt{6}, -4)$
Co-vertex: $(6, 1)$

$$\frac{(x-6)^2}{49} + \frac{(y+4)^2}{25} = 1$$

- 19) Center: $(4, 0)$
Focus: $(4, 3\sqrt{7})$
Width: 18

$$\frac{(x-4)^2}{81} + \frac{y^2}{144} = 1$$

- 20) Center: $(4, -8)$
Height: 18
Width: 14

$$\frac{(x-4)^2}{49} + \frac{(y+8)^2}{81} = 1$$

- 21) Center: $(9, -7)$
 $a = 9$
 $b = 4$
Width: 8

$$\frac{(x-9)^2}{16} + \frac{(y+7)^2}{81} = 1$$

- 22) Center at origin
Focus: $(3\sqrt{15}, 0)$
y-intercept: $(0, 3)$

$$\frac{x^2}{144} + \frac{y^2}{9} = 1$$

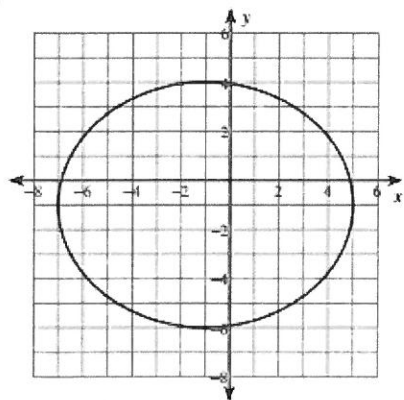
- 23) Endpoints of major axis: $(4, 18), (4, -4)$
Endpoints of minor axis: $(12, 7), (-4, 7)$

$$\frac{(x-4)^2}{64} + \frac{(y-7)^2}{121} = 1$$

- 24) Major axis is vertical
Center: $(8, -2)$
Major axis is 18 units long
Minor axis is 8 units long

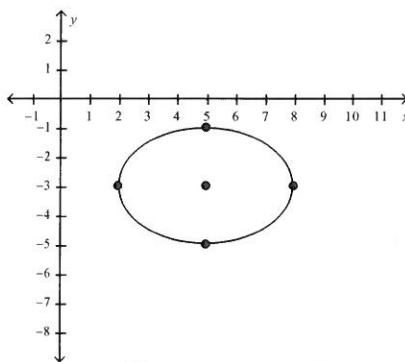
$$\frac{(x-8)^2}{16} + \frac{(y+2)^2}{81} = 1$$

25)



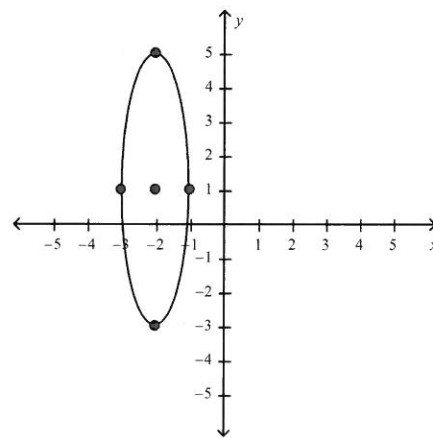
$$\frac{(x+1)^2}{36} + \frac{(y+1)^2}{25} = 1$$

26)



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

27)



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

EXTRA CREDIT OPPORTUNITY: Complete the square to turn the ellipse into standard form. Then graph.

1) $4y^2 - 338x + 32y = -169x^2 + 443$

2) $-16y + 52 = -2x^2 - 8x - y^2$

3) $126y + 9y^2 - 8x - 131 = -4x^2$