Math 3 Unit 7: Parabolas & Circles

Unit	Title	Standards
7.1	Introduction to Circles	G.GPE.1, F.IF.8.a, F.IF.8
7.2	Converting Circles to Descriptive Form	G.GPE.1, A.CED.4, F.IF.8
7.3	Definition of a Parabola from the Focus and Directrix	G.GPE.2
7.4	Sideways Parabolas from the Focus and Directrix	G.GPE.2, A.CED.4
7.5	Transformations of Parabolas	G.GPE.2, A.CED.4
7.6	Converting Parabolas from General to Descriptive Form	G.GPE.2, A.CED.4, F.IF.8.a
7.7	Converting Parabolas and Circles to Descriptive Form	G.GPE.1, G.GPE.2, A.CED.4, F.IF.8.a
Unit 7 Performance Task	Parabola Calculation Challenge	
Unit 7 Review		

Additional Clovis Unified Resources

http://mathhelp.cusd.com/courses/math-3

Clovis Unified is dedicated to helping you be successful in Math 3. On the website above you will find videos from Clovis Unified teachers on lessons, homework, and reviews. Digital copies of the worksheets, as well as hyperlinks to the videos listed on the back are also available at this site.

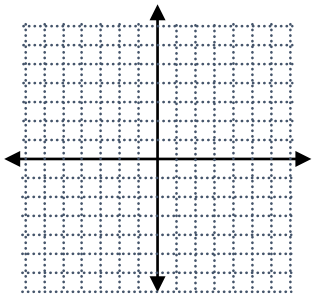
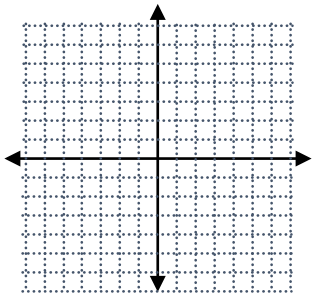
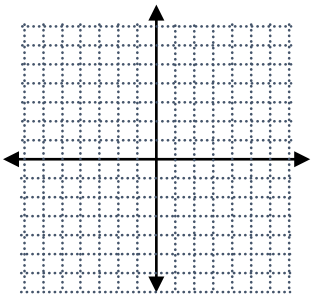
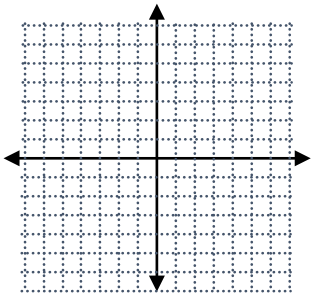
Math 3 Unit 7: Online Resources

7.1	Introduction to Circles	• Khan Academy: Features of a Circle from its Standard Equation http://bit.ly/71itca • Khan Academy: Graphing a Circle from its Standard Equation http://bit.ly/71itcb • Purple Math: Circles: Introduction & Drawing http://bit.ly/71itcc • Khan Academy: Completing the Square http://bit.ly/71itcf • Purple Math: Solving Quadratic Equations: Solving by Completing the Square http://bit.ly/71itcg
7.2	Converting Circles to Descriptive Form	• Khan Academy: Features of a Circle from its Expanded Equation http://bit.ly/72ccdfa • Purple Math: Completing the Square: Circle Equations http://bit.ly/72ccdfb • Patrick JMT: Finding the Center-Radius Form of a Circle by Completing the Square http://bit.ly/72ccdfc
7.3	Definition of a Parabola from the Focus and Directrix	• Khan Academy: Intro to Focus & Directrix http://bit.ly/73dopa • Lawrence Math Academy: Equation of Parabola from Focus and Directrix http://bit.ly/73dopc • Purple Math: Parabolas: Introduction (note: p = c) http://bit.ly/73dopd • Mario's Math Tutoring: Graphing using Focal Chord http://bit.ly/73dopf • Patrick JMT: Conic Sections, Parabola: Sketch Graph by Finding Focus, Directrix, Points (note: p = c) http://bit.ly/73dopg and http://bit.ly/73doph
7.4	Sideways Parabolas from the Focus and Directrix	• Coolmath.com: Sideways Parabolas (Pages 1 – 5) http://bit.ly/74spfda • Purple Math: Parabolas: Introduction (note: p = c) http://bit.ly/73dopd
7.5	Transformations of Parabolas	• Patrick JMT: Conic Sections: Parabolas, Part 2 (Directrix and Focus) -start at 3:10 minutes http://bit.ly/75topa • Purple Math: Parabolas: Finding the Equation from Information http://bit.ly/75topb
7.6	Converting Parabolas from General to Descriptive Form	• Khan Academy: Finding the Vertex of a Parabola in Standard Form http://bit.ly/76cpgda • Patrick JMT: Conic Sections: Parabolas, Part 1 http://bit.ly/76cpgdb
7.7	Converting Parabolas and Circles to Descriptive Form	• Khan Academy: Vertex & Axis of Symmetry of a Parabola http://bit.ly/77cpcgda • Purple Math: Conic Sections Parabolas: Finding Information from the Equation http://bit.ly/77cpcgdb • Patrick JMT: Conic Sections: Parabolas, Part 1 http://bit.ly/76cpgdb

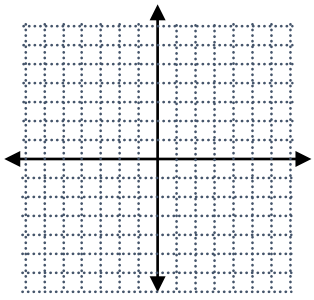
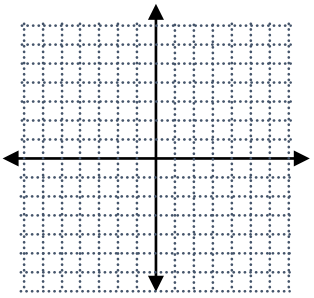
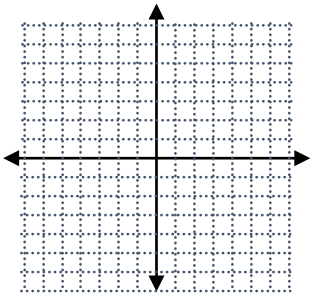
Math 3 Unit 7 Worksheet 1 **Name:**_____
Introduction to Circles **Date:**_____ **Per:**_____

[1-7] Identify the center and radius for the circle. Sketch the circle and be sure to identify the scale being used.

1. $x^2 + y^2 = 49$ 2. $x^2 + y^2 = 40$ 3. $x^2 + y^2 = 11$ 4. $(x + 4)^2 + (y - 7)^2 = 4$

5. $(x - 8)^2 + (y + 3)^2 = 80$ 6. $x^2 + (y - 1)^2 < 144$ 7. $(x + 5)^2 + y^2 \geq 225$

[8-11] Write the equation of the circle with the information given:

8. The circle is shifted from the origin 3 units left and 5 units up, with a radius of 3

9. The circle is shifted from the origin 12 units right and 8 units down, with a radius of 11

10. The circle is shifted from the origin 4 units down, with a radius of $3\sqrt{2}$.

11. The circle is shifted from the origin 5 units right, with a radius of $5\sqrt{3}$.

12. Is the point $(2, 4)$ inside, outside, or on the circle, $(x + 1)^2 + (y - 1)^2 = 16$? Justify your response.

13. Is the point $(5, -5)$ inside, outside, or on the circle, $(x + 1)^2 + (y + 2)^2 = 49$? Justify your response.

[14-19] Complete the square and write the trinomial as a perfect square. No decimals allowed.

14. $x^2 + 10x +$ ____ = 3 + ____ 15. $x^2 + 16x +$ ____ = 0 + ____ 16. $x^2 - 8x +$ ____ = 5 + ____

( )^2 = _____ ( )^2 = _____ ( )^2 = _____

17. $x^2 - 20x +$ ____ = – 2 + ____ 18. $x^2 - 14x +$ ____ = – 4 + _____ 19. $x^2 + 5x +$ ____ = 1 + _____

( )^2 = _____ ( )^2 = _____ ( )^2 = _____

20. $x^2 - \frac{1}{4}x +$ _____ = 1 + _____ 21. $y^2 + \frac{2}{3}y +$_____ = $\frac{1}{3}$ + _____

( )^2 = ____ ( )^2 = _____

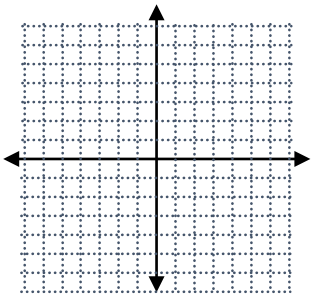
[22-24] Rewrite the following as $(x - a)^2 = b$ by completing the square.

22. $x^2 - 6x = 4$ 23. $x^2 + 10x = 0$ 24. $x^2 + 2x + 5 = 0$

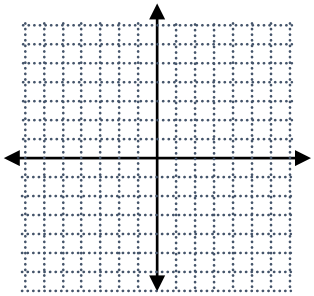
Math 3 Unit 7 Worksheet 2 **Name:**_____
Converting Circles to Descriptive Form **Date:**_____ **Per:**_____

[1-6] Convert the following circle equations to descriptive form, $(x-h)^2+(y-k)^2=r^2$, by completing the square. Identify the center and the radius for each circle. Sketch the circle and be sure to label the scale being used.

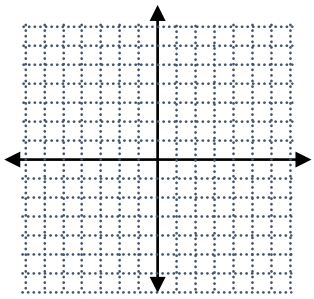
1. $x^2+y^2-10x-4y+20=0$



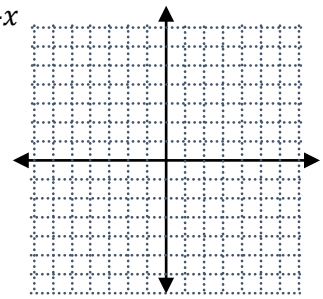
2. $x^2+y^2+6x+8y=0$



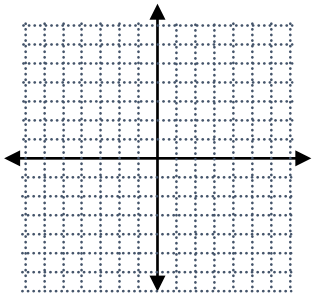
3. $x^2+y^2+13=8x-2y$



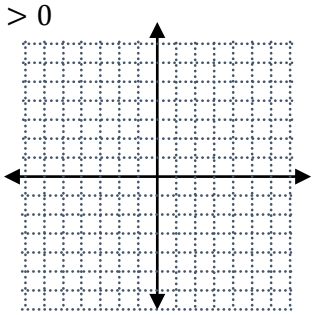
4. $x^2+y^2+33=14y-4x$



5. $x^2+y^2-12y-12\leq 0$



6. $x^2+y^2-6x+2y-38>0$



[7-12] Convert the following circle equations to descriptive form, $(x-h)^2+(y-k)^2=r^2$, by completing the square. Identify the center and the radius for each circle.

7. $x^2+y^2-7x+6y-\frac{111}{4}=0$

8. $x^2+y^2+2x+9y+\frac{37}{4}=0$

9. $x^2 + y^2 + 8x + \frac{319}{25} = 0$

10. $x^2 + y^2 + 12x + 4y - 35 = 0$

11. $x^2 + y^2 + \frac{101}{4} = 16x - 5y$

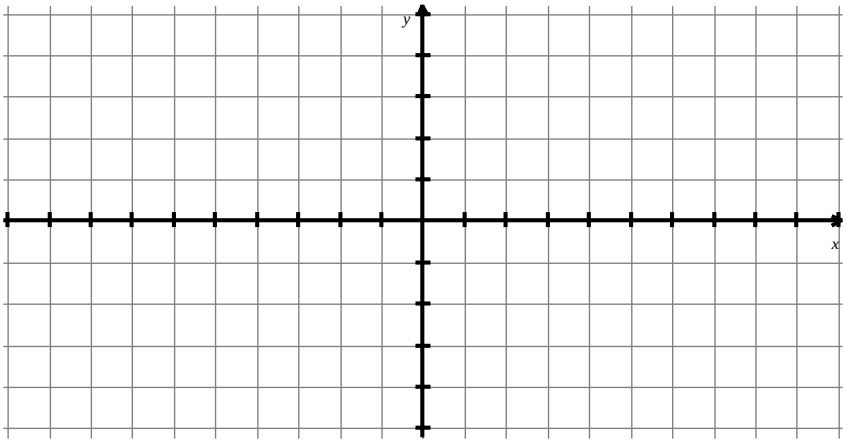
12. $x^2 + y^2 + 11x - 16y + \frac{125}{4} = 0$

13. Show that the circle with equation $x^2 + y^2 + 74 = 6(y - 3x)$ is congruent to the circle with center at $(0, 0)$ and radius 4. {*i.e.* Show the radius from the first circle is congruent to the radius from the second, and indicate the translation required to map the first circle to the second circle.}

14. Show that the circle with equation $208 = x(x - 8) + y(y + 2)$ is a dilation image of the circle with center at $(4, -1)$ and radius 6. {*i.e.* Show the center of the first circle is same as the center of the second, and find the ratio of dilation.}

Math 3 Unit 7 Worksheet 3 **Name:**_____
Definition of a Parabola from the Focus and Directrix **Date:**_____ **Per:**_____

1. Graph the parabola $x^2 = 16y$. Find and graph the focus, directrix, and focal chord endpoints.



Vertex: _____

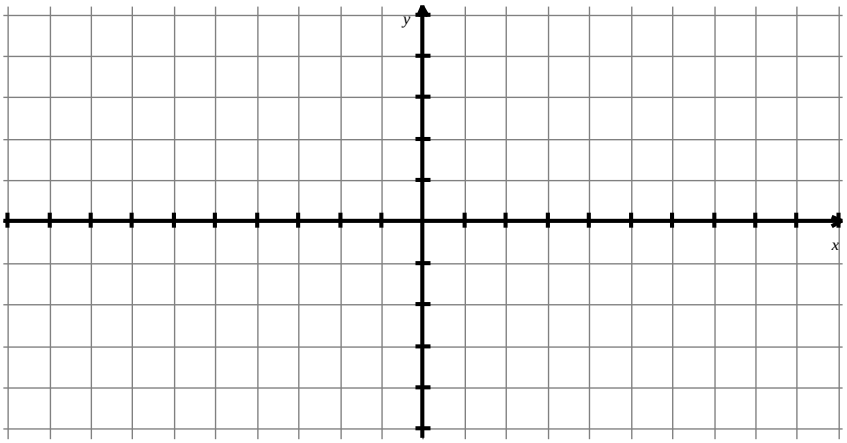
Focus: _____

Directrix: _____

Focal chord endpoints:

_____ and _____

2. Graph the parabola $y = \frac{1}{2}x^2$. Find and graph the focus, directrix, and focal chord endpoints.



Vertex: _____

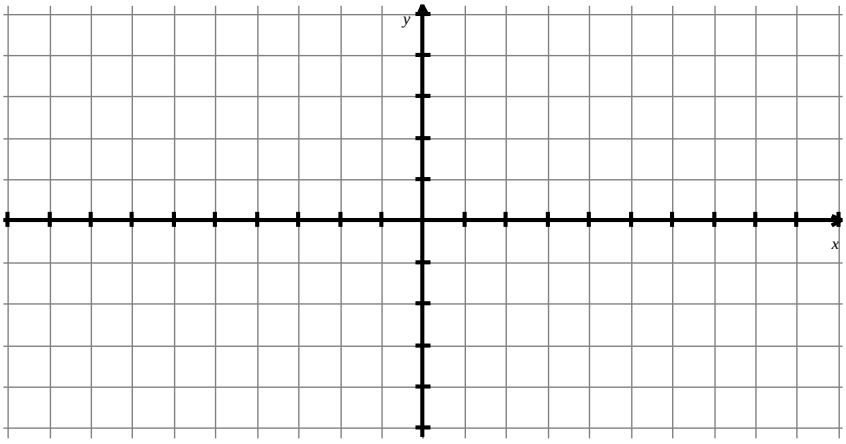
Focus: _____

Directrix: _____

Focal chord endpoints:

_____ and _____

3. Graph the parabola $x^2 = -8y$. Find and graph the focus, directrix, and focal chord endpoints.



Vertex: _____

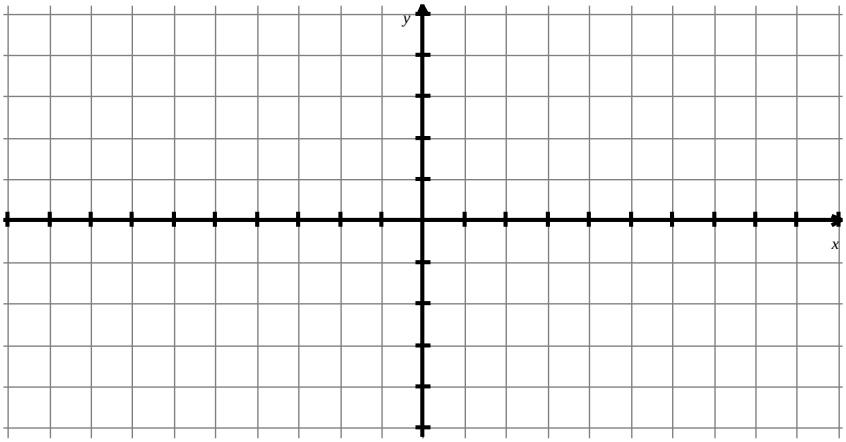
Focus: _____

Directrix: _____

Focal chord endpoints:

_____ and _____

4. Graph the parabola $y = \frac{1}{20}x^2$. Find and graph the focus, directrix, and focal chord endpoints.



Vertex: _____

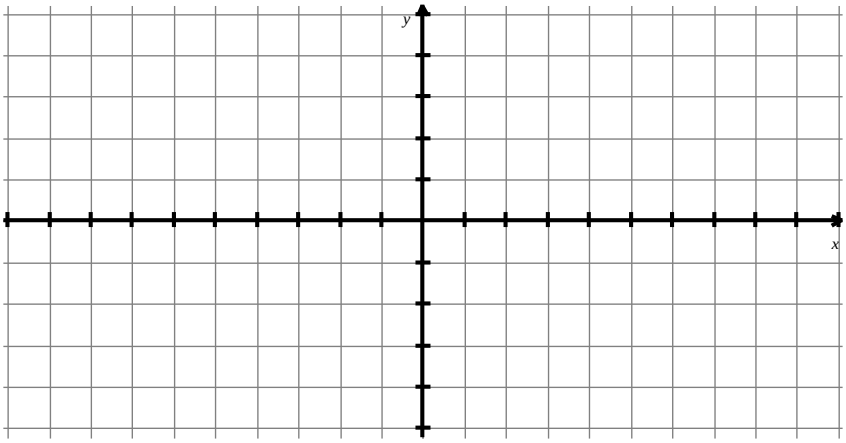
Focus: _____

Directrix: _____

Focal chord endpoints:

_____ and _____

5. Graph the parabola $x^2 = -10y$. Find and graph the focus, directrix, and focal chord endpoints.



Vertex: _____

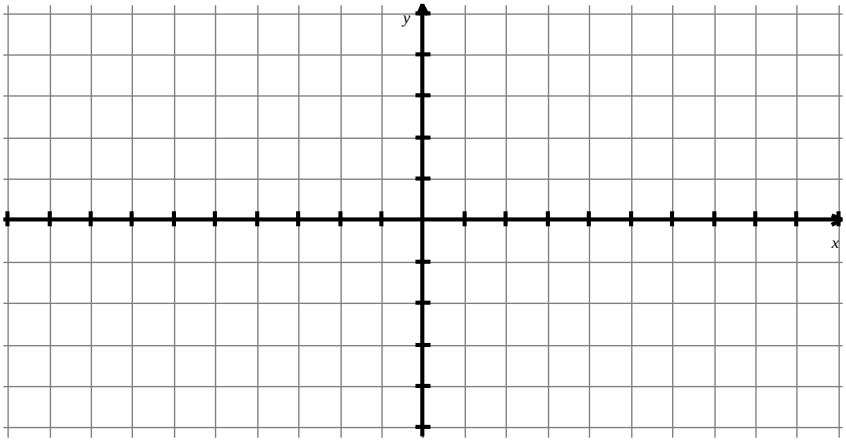
Focus: _____

Directrix: _____

Focal chord endpoints:

_____ and _____

6. Graph the parabola $y = -\frac{1}{14}x^2$. Find and graph the focus, directrix, and focal chord endpoints.



Vertex: _____

Focus: _____

Directrix: _____

Focal chord endpoints:

_____ and _____

For each of the following, use the formal definition of a parabola to derive the equation in focal width form.

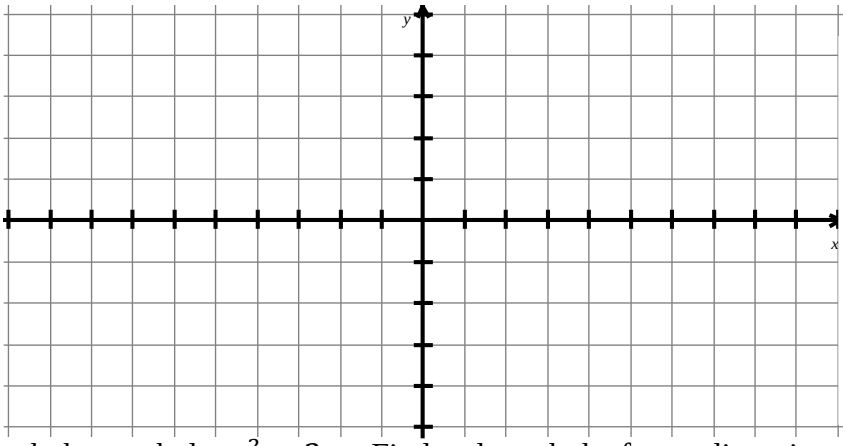
7. the parabola with focus (0,4) and directrix y = -4

8. the parabola with focus (0,-12) and directrix y = 12

9. the parabola with focus (0,10) and directrix y = -10

Math 3 Unit 7 Worksheet 4 **Name:**_____
Sideways Parabolas from the Focus and Directrix **Date:**_____ **Per:**_____

1. Graph the parabola $x = \frac{1}{4}y^2$. Find and graph the focus, directrix, and focal chord endpoints.



Vertex: _____

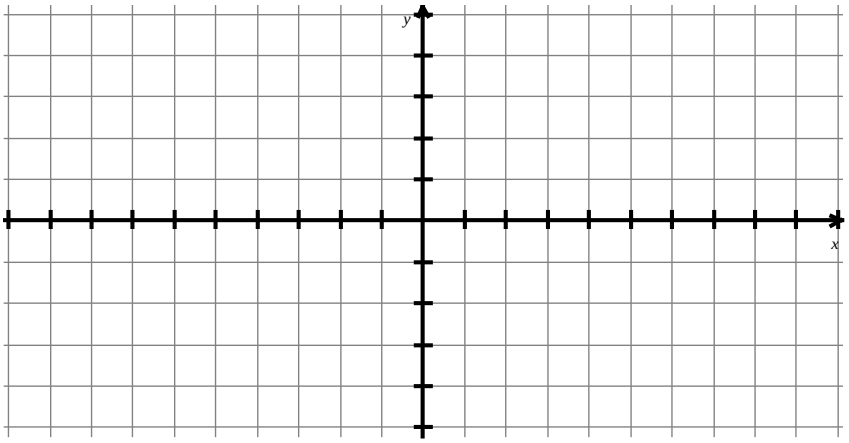
Focus: _____

Directrix: _____

Focal chord endpoints:

_____ and _____

2. Graph the parabola $y^2 = 2x$. Find and graph the focus, directrix, and focal chord endpoints.



Vertex: _____

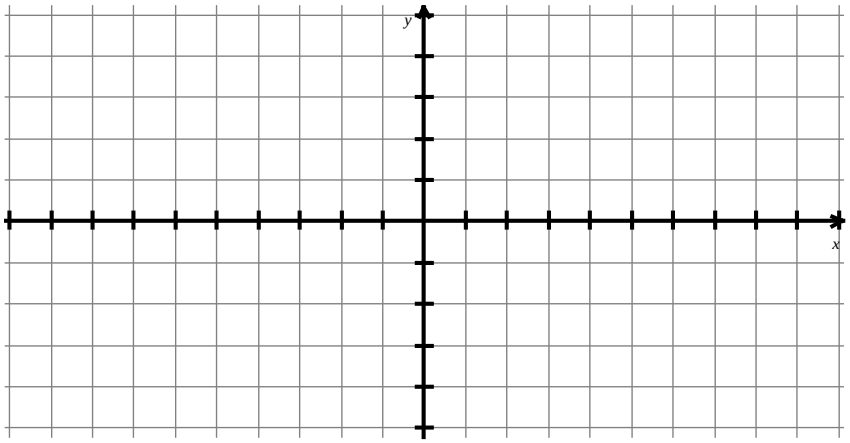
Focus: _____

Directrix: _____

Focal chord endpoints:

_____ and _____

3. Graph the parabola $x = -\frac{1}{2}y^2$. Find and graph the focus, directrix, and focal chord endpoints.



Vertex: _____

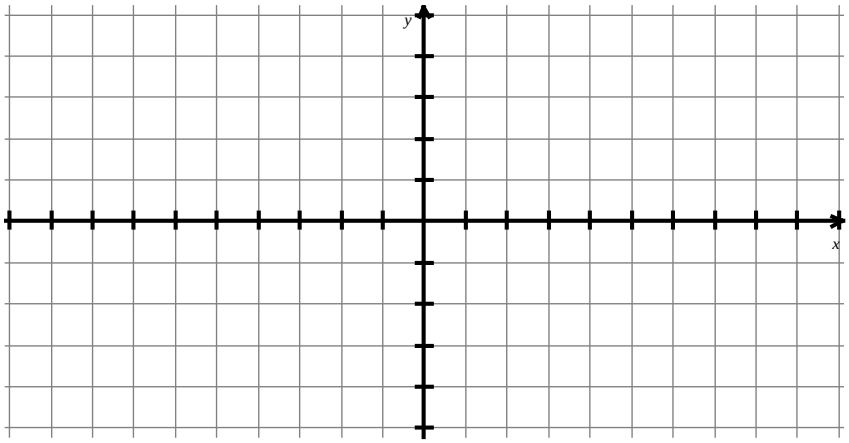
Focus: _____

Directrix: _____

Focal chord endpoints:

_____ and _____

4. Graph the parabola $y^2 = 3x$. Find and graph the focus, directrix, and focal chord endpoints.



Vertex: _____

Focus: _____

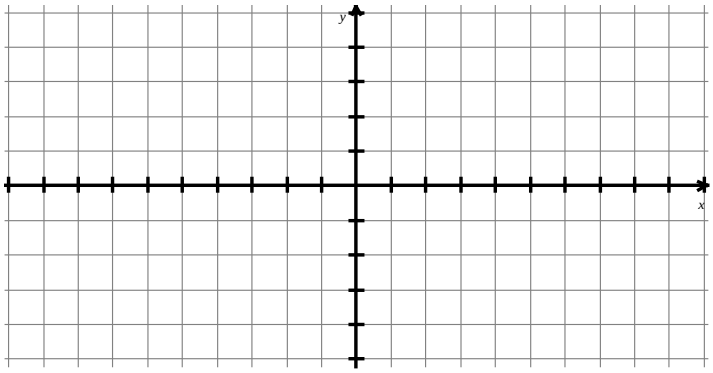
Directrix: _____

Focal chord endpoints:

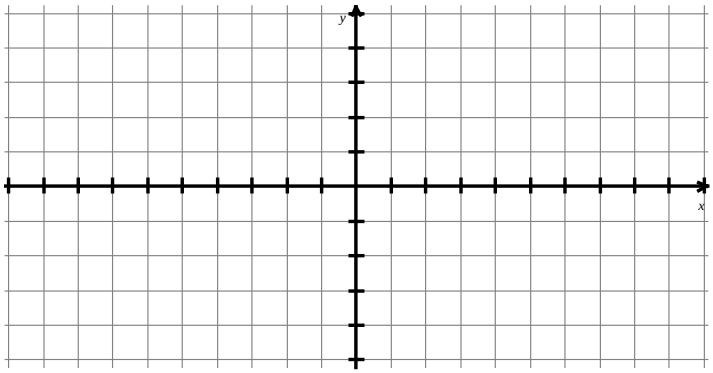
_____ and _____

[5-6] For each of the following, make a sketch and use the formal definition of a parabola to derive the equation in vertex (descriptive) form.

5. the parabola with focus (2,0) and directrix x = -2



6. the parabola with focus (-8,0) and directrix x = 8



[7-8] Complete the square for each circle to get the equation into standard/descriptive form. Identify center and radius.

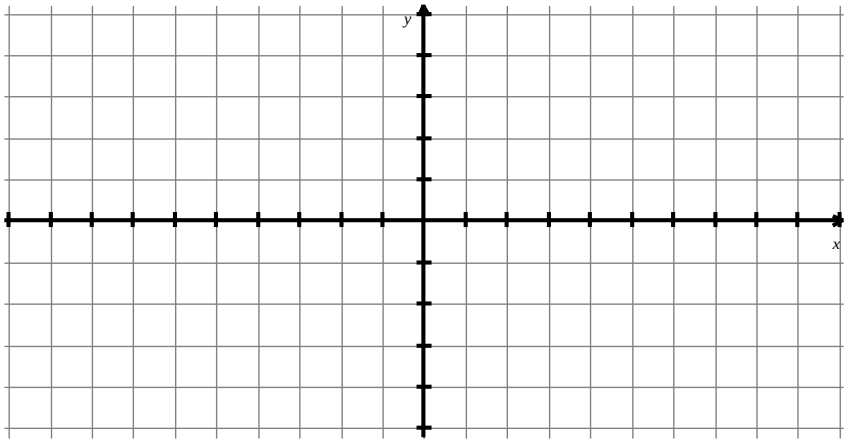
7. $x^2 + y^2 - 20x + 6y - 16 = 0$

8. $x^2 + y^2 + 2x - 12y + 19 = 0$

Math 3 Unit 7 Worksheet 5
Transformations of Parabolas

Name:_____
Date:_____ **Per:**_____

1. Graph the parabola $(x+3)^2 = 12(y-1)$. Find and graph the vertex, focus, directrix, and focal chord endpoints.



Vertex: _____

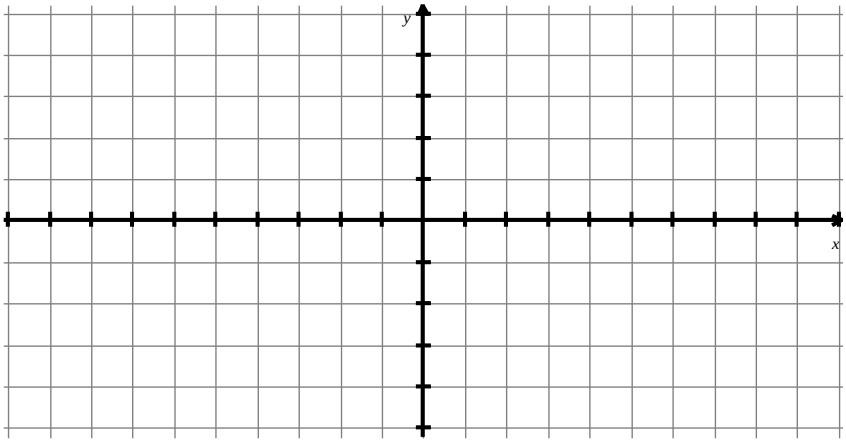
Focus: _____

Directrix: _____

Focal chord endpoints:

_____ and _____

2. Graph the parabola $x = \frac{1}{2}(y-2)^2 - 4$. Find and graph the vertex, focus, directrix, and focal chord endpoints.



Vertex: _____

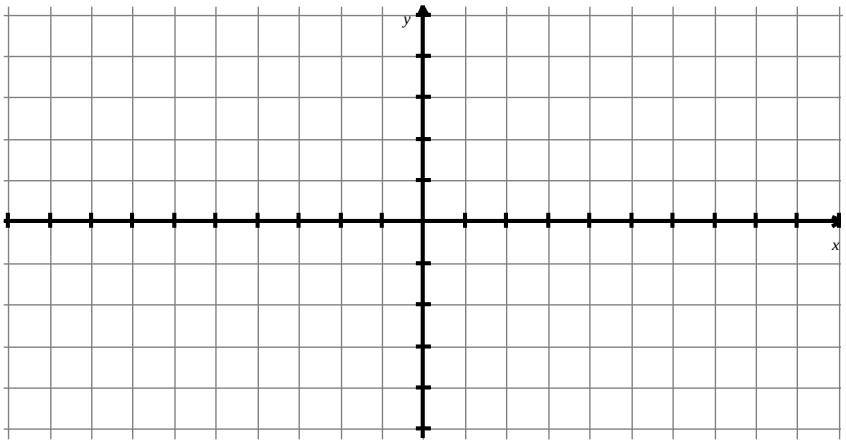
Focus: _____

Directrix: _____

Focal chord endpoints:

_____ and _____

3. Graph the parabola $(x-3)^2 = -8y$. Find and graph the vertex, focus, directrix, and focal chord endpoints.



Vertex: _____

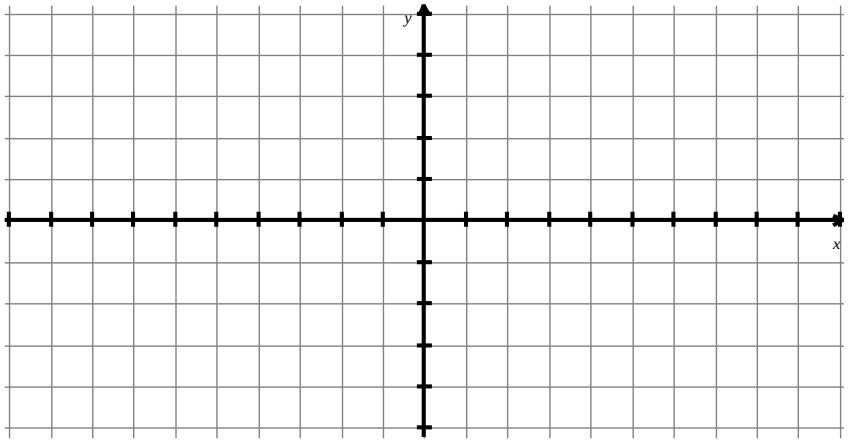
Focus: _____

Directrix: _____

Focal chord endpoints:

_____ and _____

4. Graph the parabola $y = \frac{1}{20}x^2 + 4$. Find and graph the vertex, focus, directrix, and focal chord endpoints.



Vertex: _____

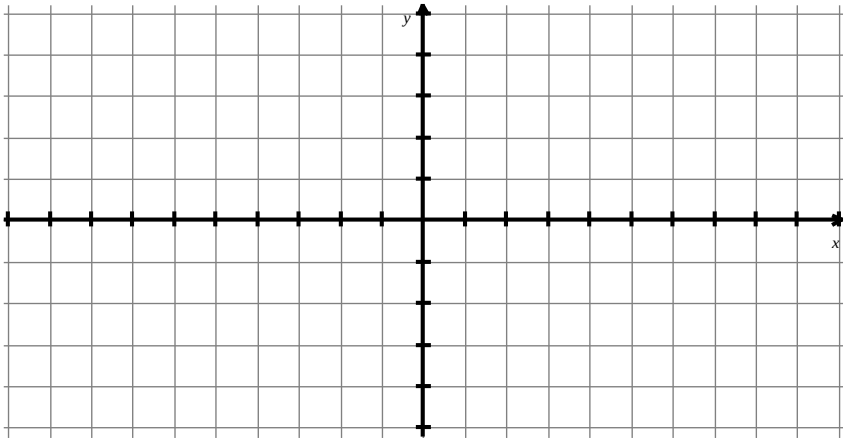
Focus: _____

Directrix: _____

Focal chord endpoints:

_____ and _____

5. Graph the parabola$(y + 2)^2 = -3(x - 1)$. Find and graph the vertex, focus, directrix, and focal chord endpoints.



Vertex: _____

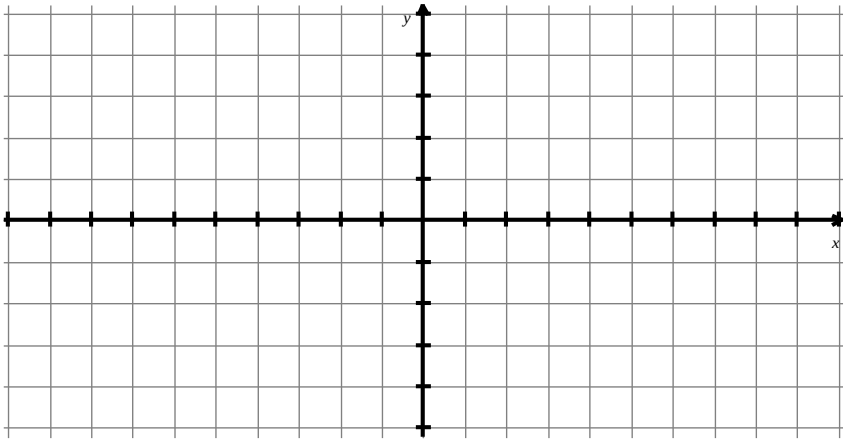
Focus: _____

Directrix: _____

Focal chord endpoints:

_____ and _____

6. Graph the parabola $x = \frac{1}{10}(y + 1)^2 - 4$. Find and graph the vertex, focus, directrix, and focal chord endpoints.



Vertex: _____

Focus: _____

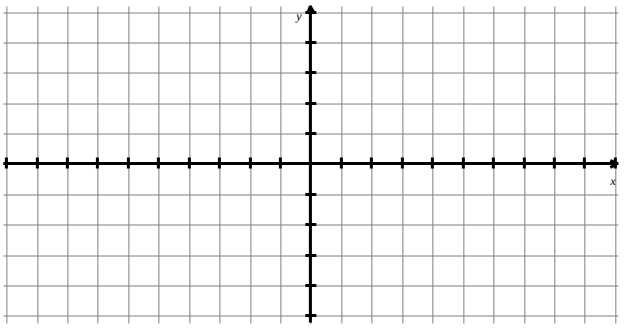
Directrix: _____

Focal chord endpoints:

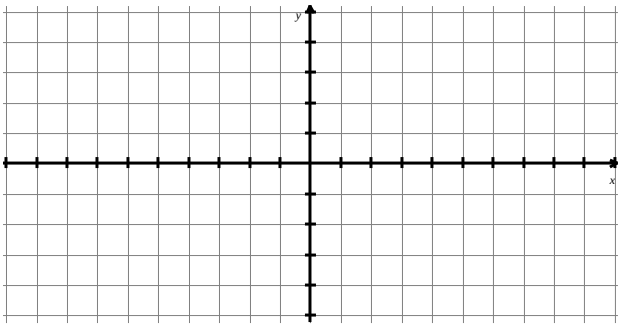
_____ and _____

[7-9] For each of the following, make a sketch and use the formal definition of a parabola to derive the equation in descriptive form.

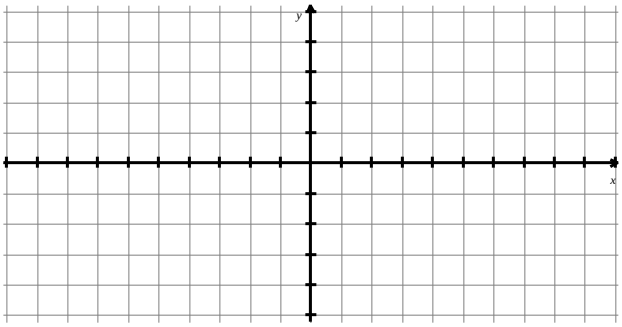
7. the parabola with focus (2,1) and directrix x = -2



8. the parabola with focus (-8,3) and directrix y = -1



9. the parabola with focus (1,2) and directrix x = 3



[10-11] Complete the square for each circle. Identify center and radius.

10. $2x^2 + 2y^2 + 24x - 16y - 40 = 0$

11. $x^2 + y^2 - 5x + 9y - \frac{15}{4} = 0$

Math 3 Unit 7 Worksheet 6 **Name:**_____
Converting Parabolas from General to Descriptive Form **Date:**_____ **Per:**_____

For each equation, identify the direction the parabola opens (left, right, up or down); complete the square to write the equation in descriptive form; and indicate the parabola's vertex. Show all work!

1. $y = 2x^2 + 16x + 7$

Direction: _____ Vertex: _____

Equation: _____

2. $x = -5y^2 - 30y + 4$

Direction: _____ Vertex: _____

Equation: _____

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

Direction: _____ Vertex: _____

Equation: _____

4. $x = 2y^2 - 12y - 11$

Direction: _____ Vertex: _____

Equation: _____

5. $x = 4y^2 - 4y + \frac{7}{8}$

Direction: _____ Vertex: _____

Equation: _____

6. $y = \frac{1}{2}x^2 + 10x + 2$

Direction: _____ Vertex: _____

Equation: _____

7. $y = -3x^2 + 12x + 13$

Direction: _____ Vertex: _____

Equation: _____

8. $x = -3y^2 + 36y - 1$

Direction: _____ Vertex: _____

Equation: _____

9. $x = \frac{1}{3}y^2 + 8y + 120$

Direction: _____ Vertex: _____

Equation: _____

Vertex answers: Not In Order		
$(2, 25)$	$(49, -3)$	$(72, -12)$
$(-4, -25)$	$(4, 7)$	$\left(-\frac{1}{8}, \frac{1}{2}\right)$
$(107, 6)$	$(-10, -48)$	$(-29, 3)$

Selected answers for equations:

2. $x = -5(y + 3)^2 + 49$ opens left

6. $y = \frac{1}{2}(x + 10)^2 - 48$ opens up

8. $x = -3(y - 6)^2 + 107$ opens left

Math 3 Unit 7 Worksheet 7 **Name:**_____
Converting Parabolas and Circles to Descriptive Form **Date:**_____ **Per:**_____

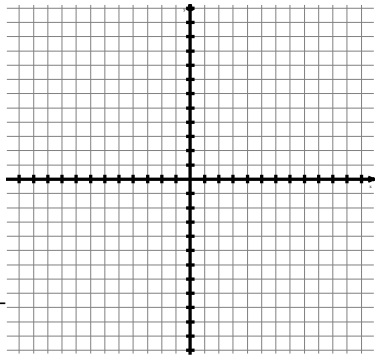
Show all appropriate work. {It might be possible to sketch and/or answer the follow-up information before converting to descriptive form. You may do this, but you must still do the algebraic manipulation needed to convert each to descriptive form.}

Descriptive form reminder: Parabola: $y = a(x-h)^2 + k$ *or* $x = a(y-k)^2 + h$ & Circle: $(x-h)^2 + (y-k)^2 = r^2$

[1-4]: A) Convert to descriptive form, B) sketch, and identify the following for each:
C) Vertex D) Line/Axis of symmetry E) Focus F) Directrix G) Focal Chord Endpoints.

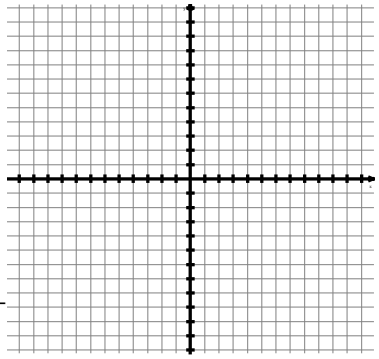
1) $(x-3)^2 = 8(y-5)$

Vertex: _____
Line of Symmetry: _____
Focus: _____
Directrix: _____
Focal chord endpoints:
_____ and _____



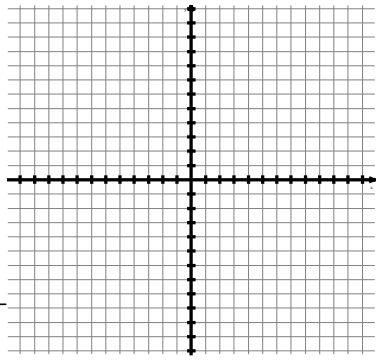
2) $(y+2)^2 = 4(x+1)$

Vertex: _____
Line of Symmetry: _____
Focus: _____
Directrix: _____
Focal chord endpoints:
_____ and _____



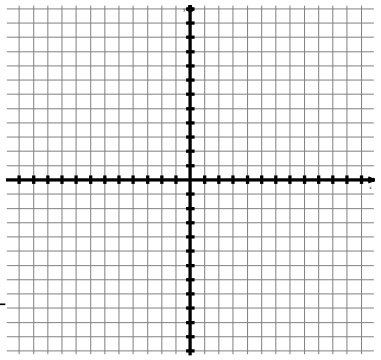
3) $y = -\frac{1}{4}x^2 + 5x - 20$

Vertex: _____
Line of Symmetry: _____
Focus: _____
Directrix: _____
Focal chord endpoints:
_____ and _____



4) $x = \frac{1}{2}y^2 + 4y + 13$

Vertex: _____
Line of Symmetry: _____
Focus: _____
Directrix: _____
Focal chord endpoints:
_____ and _____



[5-10]: A) Convert to descriptive form, B) sketch, <u>and</u> identify the following for each:
C) Vertex D) Axis/Line of symmetry E) Number of *x*-intercepts F) Number of *y*-intercepts.

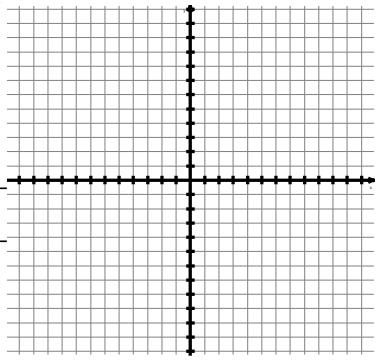
5) $(x-5)^2+3(y-2)=0$

Vertex: _____

Line of Symmetry: _____

Number of x-intercepts: _____

Number of y-intercepts: _____



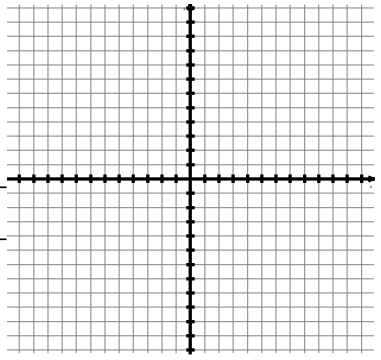
6) $x=-y^2+6y-8$

Vertex: _____

Line of Symmetry: _____

Number of x-intercepts: _____

Number of y-intercepts: _____



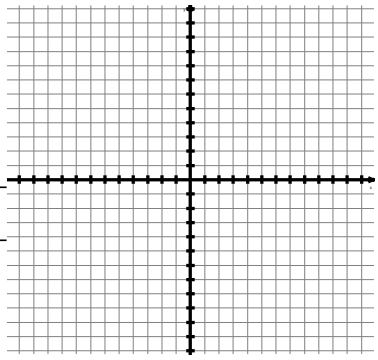
7) $x=-3y^2+6y-5$

Vertex: _____

Line of Symmetry: _____

Number of x-intercepts: _____

Number of y-intercepts: _____



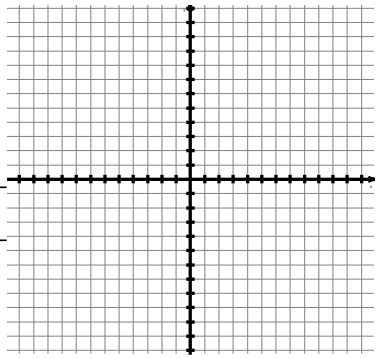
8) $y=2x^2-28x+98$

Vertex: _____

Line of Symmetry: _____

Number of x-intercepts: _____

Number of y-intercepts: _____



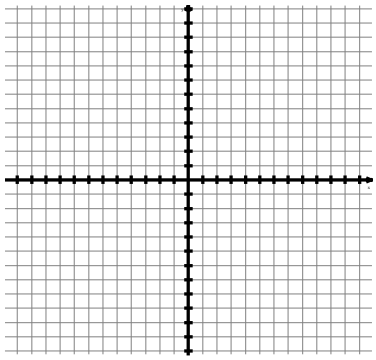
9) $(y-4)^2 = 12x$

Vertex: _____

Line of Symmetry: _____

Number of x-intercepts: _____

Number of y-intercepts: _____



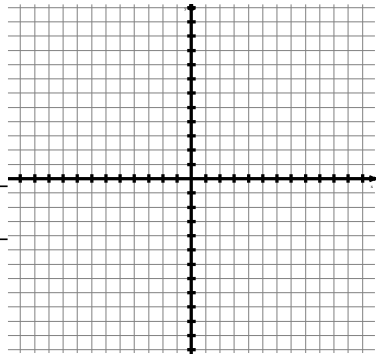
10) $(x+4)^2 + 6(y+2) = 0$

Vertex: _____

Line of Symmetry: _____

Number of x-intercepts: _____

Number of y-intercepts: _____



[11-12]: A) Convert to descriptive form, B) sketch, <u>and</u> identify the following for each:
C) Center D) Radius E) Number of *x*-intercepts F) Number of *y*-intercepts.

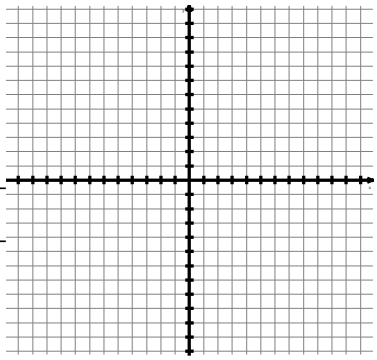
11) $x^2 + y^2 - 4x + 10y + 25 = 0$

Center: _____

Radius: _____

Number of x-intercepts: _____

Number of y-intercepts: _____



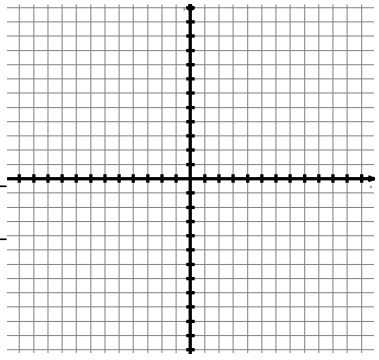
12) $x^2 + y^2 + 8x - 2y + 5 = 0$

Center: _____

Radius: _____

Number of x-intercepts: _____

Number of y-intercepts: _____



Math 3 Unit 7 Review Worksheet 1 **Name:**_____
Parabolas & Circles **Date:**_____ **Per:**_____

1. Is the point $(3, 10)$ on the parabola, $y + 6 = (x + 1)^2$? Justify your response.

2. Is the point $(1, 4)$ inside, outside, or on the circle, $(x + 2)^2 + (y - 1)^2 = 16$? Justify your response.

3. Is the point $(-7, 5)$ inside, outside, or on the circle, $(x + 1)^2 + (y - 2)^2 = 49$? Justify your response.

4. What is the vertex and the length of the focal chord for the parabola, $x = \frac{1}{12}(y - 3)^2 - 1$?

   Vertex: _____

   Focal chord length: _____

5. What is the center and the length of the radius for the circle, $x^2 + y^2 + 8x - 6y - 3 = 0$?

   Center: _____

   Radius: _____

6. What is the vertex and the length of the focal chord for the parabola, $2x^2 - 12x - 5y - 12 = 0$?

   Vertex: _____

   Focal chord length: _____

7. Write the equation for the circle with center $(4, -1)$ and diameter $8\sqrt{2}$.

8. Using the distance formula and the definition of parabola, write the equation for the parabola in focal width form, $(y - k)^2 = 4c(x - h)$, that has a focus at the point $(-7, 2)$ and a directrix of $x = 1$.

9. Using the distance formula and the definition of parabola, write the equation for the parabola in vertex/descriptive form, $y = a(x-h)^2 + k$, that has a directrix of $y = 2$ and a focus at the point $(-1, 8)$.

10. Sketch the graph for the parabola, $x^2 = 2(y-1)$. Find, graph, and identify the focus, directrix, and focal chord endpoints.

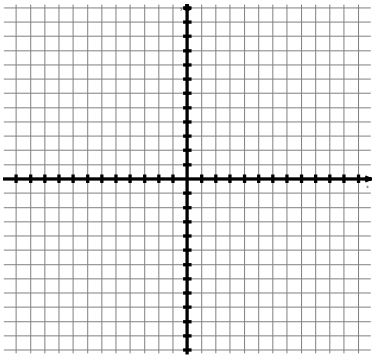
Vertex: _____

Focus: _____

Directrix: _____

Focal chord endpoints:

_____ and _____



11. Sketch the graph for the parabola, $x + 4 = \frac{1}{6}(y-1)^2$. Find, graph, and identify the focus, directrix, and focal chord endpoints.

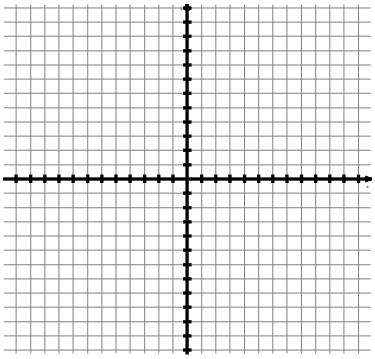
Vertex: _____

Focus: _____

Directrix: _____

Focal chord endpoints:

_____ and _____



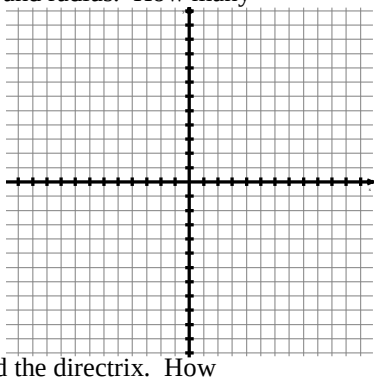
12. Sketch the graph for the circle, $x^2 + y^2 + 2y - 10x + 8 = 0$. Find, graph, and identify the center and radius. How many times does the circle intersect with the *x*-axis? the *y*-axis?

Center: _____

Radius: _____

Number of x-intercepts: _____

Number of y-intercepts: _____



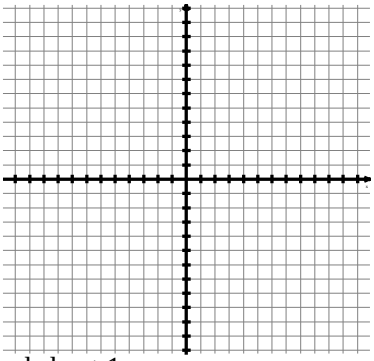
13. Sketch the graph for the parabola, $\frac{1}{4}x^2 - 4x + y + 15 = 0$. Find, graph, and identify the focus and the directrix. How many times does the parabola intersect with the *x*-axis? the *y*-axis?

Focus: _____

Directrix: _____

Number of x-intercepts: _____

Number of y-intercepts: _____



Math 3 Unit 7 Review Worksheet 2 **Name:**_____
Parabolas & Circles **Date:**_____ **Per:**_____

Show all valid & appropriate work.

1. Find the center and the radius for the circle $x^2 + y^2 - 12x + 4y = 9$. Is the point $(6, 5)$ on the circle? Justify/explain.

   Center: _____

   Radius: _____

   Is (6, 5) on the circle? Y or N

2. Write the equation for the circle with center $(5, -2)$ and with diameter $10\sqrt{3}$. Which one of the three is the correct response: The point $(-3, 2)$ is inside / outside / on the circle with center $(5, -2)$ and diameter $10\sqrt{3}$. Justify/explain.

   Equation: _____

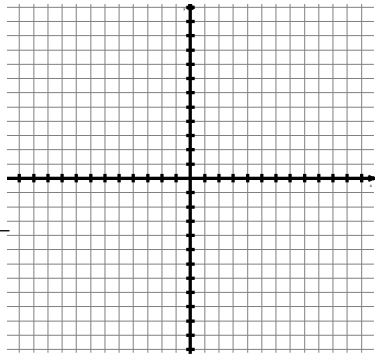
3. Write the equation for the circle with endpoints of a diameter $(3, 12)$ and $(-5, 2)$. Hint: Find the center first!
   How many times does this circle intersect with the *x*-axis? How many times does this circle intersect with the *y*-axis?

   Center: _____

   Number of x-intercepts: _____

   Number of y-intercepts: _____

   Equation: _____



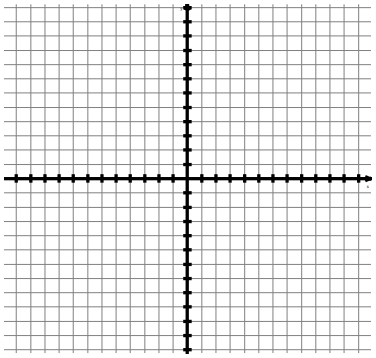
4. What is the focus and the equation of the directrix for $x - 4 = -\frac{1}{12}(y + 1)^2$? How many times does this parabola intersect with the *x*-axis? the *y*-axis?

   Focus: _____

   Directrix: _____

   Number of x-intercepts: _____

   Number of y-intercepts: _____



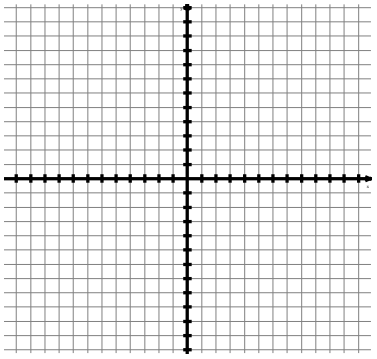
5. What is the focus and the equation of the directrix for $(x - 2)^2 = -2(y + 3)$? How many times does this parabola intersect with the *x*-axis? the *y*-axis?

   Focus: _____

   Directrix: _____

   Number of x-intercepts: _____

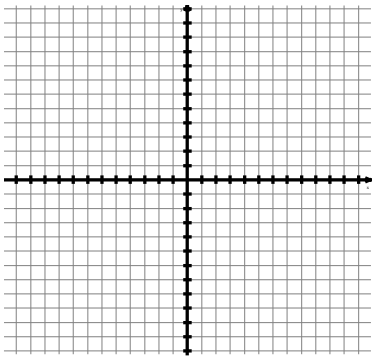
   Number of y-intercepts: _____



6. What is the vertex and the equation for the line of symmetry for the parabola $2y^2 - 20y - x + 47 = 0$?

Vertex: _____

Line of Symmetry: _____

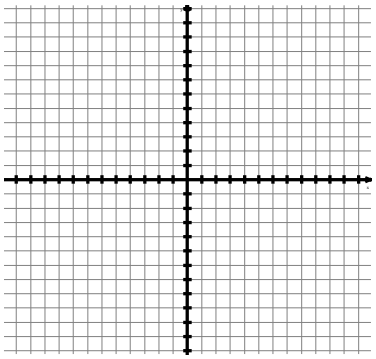


[7-8]: Using the distance formula and the definition for parabola, write the equation for each parabola in <u>either</u> Focal Width form <u>or</u> a variation of Vertex/Descriptive form.

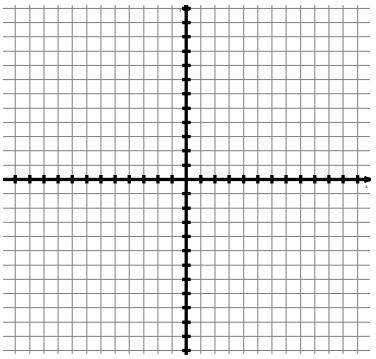
Reminders – Focal Width form: $(x-h)^2 = 4c(y-k)$ *or* $(y-k)^2 = 4c(x-h)$

Vertex/Descriptive form: $y = a(x-h)^2 + k$ *or* $x = a(y-k)^2 + h$

7. Focus is at $(-5, 0)$ and the equation for the directrix is $x = 5$. Sketch the parabola.

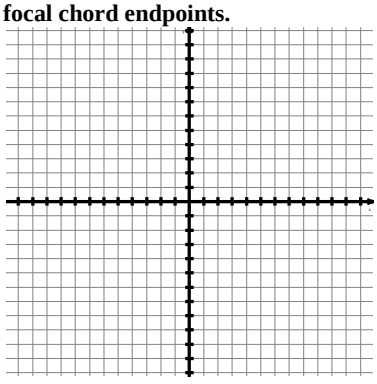


8. Focus is at $(-4, 5)$ and the equation for the directrix is $y = -3$. Sketch the parabola.

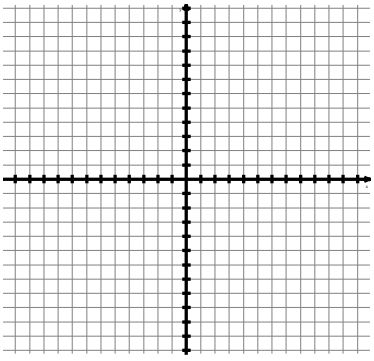


[9-10]: Convert to either Focal Width form or a variation of Vertex/Descriptive form. Once you have done this, sketch the parabola, find and graph the focus, directrix, and focal chord endpoints.

9. $4x + 11 = y^2 + 6y$



10. $2x^2 - 4x = 4y - 14$



Parabola Calculation Challenge:

The Golden Gate bridge is a suspension bridge in San Francisco, California. The towers are 1280 meters apart and rise 160 meters above the road. The cable just touches the sides of the road midway between the towers. What is the height of the cable 200 meters from a tower?

1. Sketch the bridge, two towers, and the cable between them on grid paper.
2. Draw a coordinate axis onto your grid so that the origin is at the point where the cable touches the road.
3. Label the points at the top of each tower with the correct coordinates based on the information given in the problem.
4. Use these points to write the equation of the parabola in vertex form. Things to think about:
    a. Should it be an x = or y = equation?
    b. Should *a* be positive or negative?
5. On your graph, mark a point, *P*, on the roadway 200 meters from the tower. Find the coordinates of that point, based on the information given in the problem.
6. On your graph, mark the point on the cable directly above point *P*. Things to think about:
    a. How does point *P* relate to the question you are trying to answer?
    b. Which part of the coordinate of *P* do you already know?
    c. Discuss the answers to these questions with your partner or group.
7. Use all of the information you have gathered, including the equation you wrote for the parabola made by the cable, to find the height of the cable 200 meters from a tower.

Math 3 Unit 7 Worksheet 2 - Selected Answers

1. $Center = (5, 2)\ \&\ r = 3$
2. $Center = (-3, -4)\ \&\ r = 5$
3. $Center = (4, -1)\ \&\ r = 2$
4. $Center = (-2, 7)\ \&\ r = 2\sqrt{5}$
5. $Center = (0, 6)\ \&\ r = 4\sqrt{3}$
6. $Center = (3, -1)\ \&\ r = 4\sqrt{3}$
7. $Center = \left(\frac{7}{2}, -3\right)\ \&\ r = 7$
8. $Center = \left(-1, -\frac{9}{2}\right)\ \&\ r = 2\sqrt{3}$
9. $Center = (-4, 0)\ \&\ r = \frac{9}{5}$
10. $Center = (-6, -2)\ \&\ r = 5\sqrt{3}$
11. $Center = \left(8, -\frac{5}{2}\right)\ \&\ r = 3\sqrt{5}$
12. $Center = \left(-\frac{11}{2}, 8\right)\ \&\ r = 3\sqrt{7}$
13. $Translation: (x, y) \rightarrow (x + 9, y - 3)$
14. $Scale\ Factor = \frac{5}{2}\ \ or\ 2.5$

Math 3 Unit 7 Worksheet 7 - Selected Answers

1) A) $y = \frac{1}{8}(x - 3)^2 + 5$ C-G) $V = (3, 5);\ Axis: x = 3;\ \ F = (3, 7);$
$Directrix: y = 3;\quad FC\ Endpts: (-1, 7)\ \&\ (7, 7)$

2) A) $x = \frac{1}{4}(y + 2)^2 - 1$ C-G) $V = (-1, -2);\ Axis: y = -2;\ \ F = (0, -2);$
$Directrix: x = -2;\quad FC\ Endpts: (0, 0)\ \&\ (0, -4)$

3) A) $y = -\frac{1}{4}(x - 10)^2 + 5$ C-G) $V = (10, 5); Axis: x = 10; F = (10, 4);$
$Directrix: y = 6\ ;\ FC\ Endpts: (8, 4)\ \&\ (12, 4)$

4) A) $x = \frac{1}{2}(y + 4)^2 + 5$C-G) $V = (5, -4);\ Axis: y = -4;\ \ F = \left(5\frac{1}{2}, -4\right);$
$Directrix: x = 4\frac{1}{2}\ ; FC\ Endpts: \left(5\frac{1}{2}, -3\right) \& \left(5\frac{1}{2}, -5\right)$

5) A) $y = -\frac{1}{3}(x - 5)^2 + 2$ C-F) $V = (5, 2);\ Axis: x = 5;\ \#\ x - int = 2;\ \#\ y - int = 1$

6) A) $x = -(y - 3)^2 + 1$ C-F) $V = (1, 3);\ Axis: y = 3;\ \#\ x - int = 1;\ \#\ y - int = 2$

7) A) $x = -3(y - 1)^2 - 2$ C-F) $V = (-2, 1);\ Axis: y = 1;\ \#\ x - int = 1;\ \#\ y - int = 0$

8) A) $y = 2(x - 7)^2$ C-F) $V = (7, 0);\ Axis: x = 7;\ \#\ x - int = 1;\ \#\ y - int = 1$

9) A) $x = \frac{1}{12}(y - 4)^2$ C-F) $V = (0, 4);\ Axis: y = 4;\ \#\ x - int = 1;\ \#\ y - int = 1$

10) A) $y = -\frac{1}{6}(x + 4)^2 - 2$ C-F) $V = (-4, -2);\ Axis: x = -4;\ \#\ x - int = 0;\ \#\ y - int = 1$

11) A) $(x - 2)^2 + (y + 5)^2 = 4$ C-F) $C = (2, -5);\ r = 2;\ \#\ x - int = 0;\ \#\ y - int = 1$

12) A) $(x + 4)^2 + (y - 1)^2 = 12$ C-F) $C = (-4, 1);\ r = 2\sqrt{3} \approx 3.5;\ \#\ x - int = 2;\ \#\ y - int = 0$

Math 3 Unit 7 Review Worksheet 1 – Selected Answers

1. Yes, why? 2. Outside, why? 3. Inside, why? 4. $V = (-1, 3); FC = 12$ 5. $C = (-4, 3); r = 2\sqrt{7}$

6. $(x-3)^2 = \frac{5}{2}(y+6)$ *or* $y = \frac{2}{5}(x-3)^2 - 6 \Leftrightarrow V = (3,-6)$ & $FC = \frac{5}{2}$ 7. $(x-4)^2 + (y+1)^2 = 32$

8. $(y+2)^2 = -16(x+3)$ 9. $y = \frac{1}{12}(x+1)^2 + 5$

10. $F = \left(0, 1\frac{1}{2}\right); Dir\ \ y = \frac{1}{2}; FC\ end\ pts\ \left(-1, 1\frac{1}{2}\right)$ & $\left(1, 1\frac{1}{2}\right)$

11. $F = \left(-2\frac{1}{2}, 1\right); Dir\ \ x = -5\frac{1}{2}; FC\ end\ pts\ \left(-2\frac{1}{2}, 4\right)$ & $\left(-2\frac{1}{2}, -2\right)$

12. $C = (5,-1); r = 3\sqrt{2} \approx 4.2; x-axis\ \ int = 2; y-axis\ \ int = 0$

13. $F = (8, 0); Dir\ \ y = 2;\ \ FC\ end\ pts\ (6,0)$ & $(10,0); x-axis\ \ int = 2; y-axis\ \ int = 1$

Math 3 Unit 7 Review Worksheet 2 – Selected Answers

1) $C = (6,-2); r = 7; Yes, (6,5)\ is\ on\ the\ circle.\ Why?$

2) $(x-5)^2 + (y+2)^2 = 75;\ \ (-3,2)\ is\ outside\ the\ circle.\ Why?$

3) $(x+1)^2 + (y-7)^2 = 41;\ \ \#\ x-int = 0; \#\ y-int = 2$

4) $F = (1,-1); dir\ is\ \ x = 7; \#\ x-int = 1; \#\ y-int = 2$

5) $F = (2,-3.5); dir\ is\ \ y = -2.5; \#\ x-int = 0; \#\ y-int = 1$

6) $V = (-3, 5); eq\ for\ L\ of\ S\ is\ \ y = 5$

7) $y^2 = -20x \quad or \quad x = -\frac{1}{20}y^2$

8) $(x+4)^2 = 16(y-1) \quad or \quad y = \frac{1}{16}(x+4)^2 + 1$

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

$eq\ of\ dir\ \ x = -6; fc\ endpts\ are\ (-4,-1)$ & $(-4,-5)$

10) $(x-1)^2 = 2(y-3) \quad or \quad y = \frac{1}{2}(x-1)^2 + 3; F = (1, 3.5);$

$eq\ of\ dir\ \ y = 2.5; fc\ endpts\ are\ (0, 3.5)$ & $(2, 3.5)$