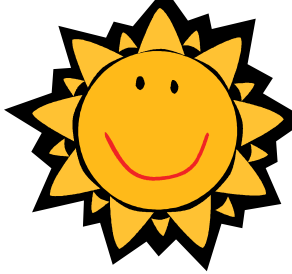
Unit 2 Day 11

Quadratic Inequalities & Systems

Warm Up



12. Given the following functions, specifically describe the transformation from the identity function $y = x^2$

a. $y = (x+3)^2 - 7$ b. $y = 5x^2 + 12$ c. $y = \frac{1}{2}(x - 2)^2 + 4$

13. Application Practice: The sum of two numbers is 21. The sum of the squares of the numbers is 305. What is the product of the two numbers?

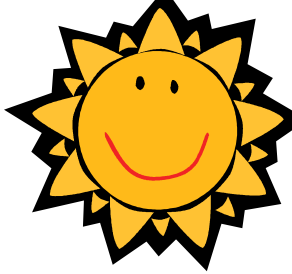
14. A Science Olympiad team is having a competition for who can pick an item that will hit the ground the fastest from a 45 ft building. Jenny picked a hockey puck creating a function of $y = -16x^2 + 45$. How many seconds has the hockey puck been in the air when it is 1 foot away from hitting the ground?

Factor completely then solve:

15. $32x^4 - 162 = 0$

16. $6x^3 - 33x^2 - 18x = 0$

Warm Up ANSWERS



12. Given the following functions, specifically describe the transformation from the identity function $y = x^2$

a. $y = (x+3)^2 - 7$

Translate 3 units left and 7 units down.

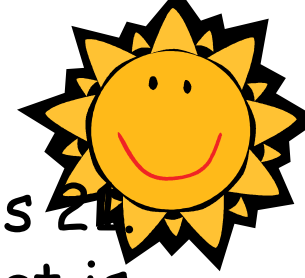
b. $y = 5x^2 + 12$

Translate 12 units up and vertical stretch by a factor of 5

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

Translate 2 units right and 4 units up.
Vertical compression by a factor of $\frac{1}{2}$.

Warm Up ANSWERS



13. Application Practice: The sum of two numbers is 21. The sum of the squares of the numbers is 305. What is the product of the two numbers?

$$x + y = 21$$
$$x^2 + y^2 = 305$$

$$y = -x + 21$$
$$x^2 + (-x + 21)^2 = 305$$
$$x^2 + (-x + 21)(-x + 21) = 305$$
$$x^2 + x^2 - 42x + 441 = 305$$
$$2x^2 - 42x + 136 = 0$$
$$2(x^2 - 21x + 68) = 0$$
$$2(x - 17)(x - 4) = 0$$

x = 17 and x = 4

17*4 = 68

Did you have trouble doing this one by hand? We'll write steps in our notes today! ☺

Warm Up ANSWERS

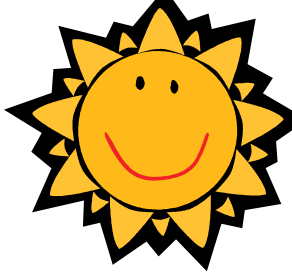
14. A Science Olympiad team is having a competition for who can pick an item that will hit the ground the fastest from a 45 ft building. Jenny picked a hockey puck creating a function of $y = -16x^2 + 45$. How many seconds has the hockey puck been in the air when it is 1 foot away from hitting the ground?

We are looking for the x-value, when the y-value is 1. In other words, find x when the coordinate point is (x, 1). If we know y=1, then we can graph this line too.

Find the intersection to get the x.

You get (1.65, 1), so the hockey puck is in the air for **1.65 seconds.**

Warm Up ANSWERS



Factor completely then solve:

15. $32x^4 - 162$

$2(16x^4 - 81)$

$2(4x^2 - 9)(4x^2 + 9)$

Factors: $2(2x + 3)(2x - 3)(4x^2 + 9)$

Solutions: $x = -3/2, 3/2, \pm 3i/2$

16. $6x^3 - 33x^2 - 18x$

$3x(2x^2 - 11x - 6)$

$3x[2x^2 - 12x + 1x - 6]$

$3x[2x(x - 6) + 1(x - 6)]$

Factors: $3x(2x + 1)(x - 6)$

Solutions: $x = 0, -1/2, 6$

Homework Page 15

1. Translate Up 5
2. Translate Left 2
3. Translate to the right 9
4. Reflect over the x-axis, vertical stretch by 4
5. Translate down 3
6. Vertical compression by 1/3
7. Translate left 2, and down 3
8. Translate right 4, vertical stretch by 2

Homework Page 15

9. Translate up 1, reflect over the x-axis, dilation vertical compression by 1/2
10. Translate right 4, reflect over the x-axis, translate up 2
11. Translate left 2, vertical compression by 2/5, translate up 1.
12. Translate right 1, vertical stretch by 3, translate down 2.
13. Vertex Form: $g(x)= (x-3)^2+6$

    Standard From: $g(x) = x^2-6x+15$

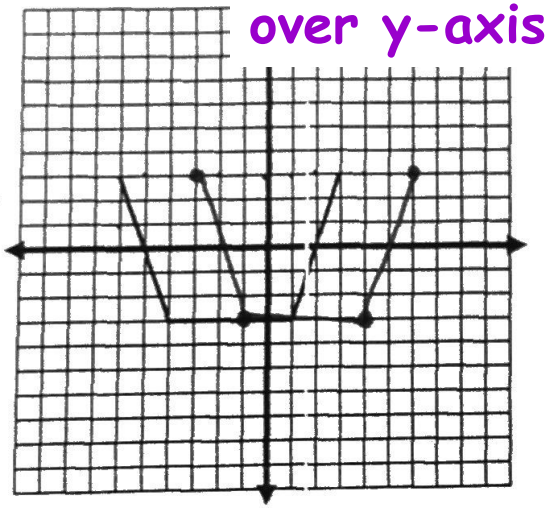
Homework Page 16

1. (-6,3) (-4,-3) (1,-3) (3,3)
2. No, just key points.
3. $\{x | -6 \le x \le 3\}$

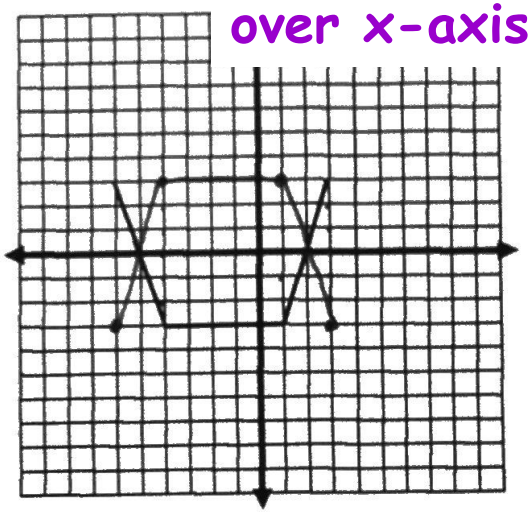
4. $\{y | -3 \le y \le 3\}$

For each of the following, list the effect on the graph of Bowl and then graph the new function.

5. $y = B(-x)$ **Reflection over y-axis**

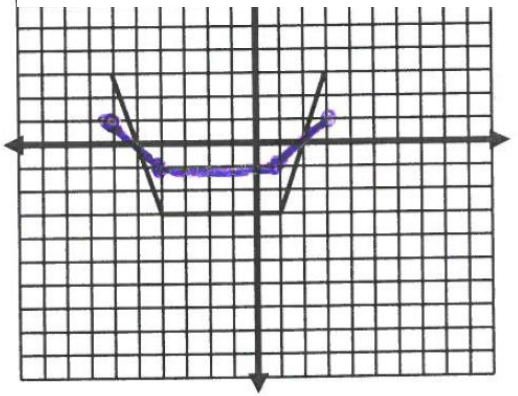


6. $y = -B(x)$ **Reflection over x-axis**

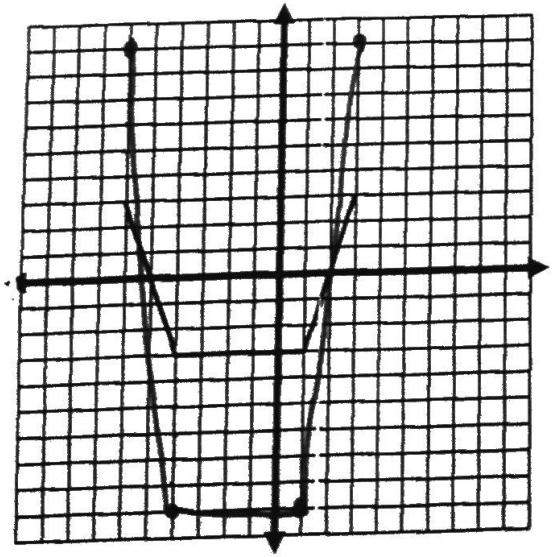


7. $y = \frac{1}{3}B(x)$ (1/3 of the height)

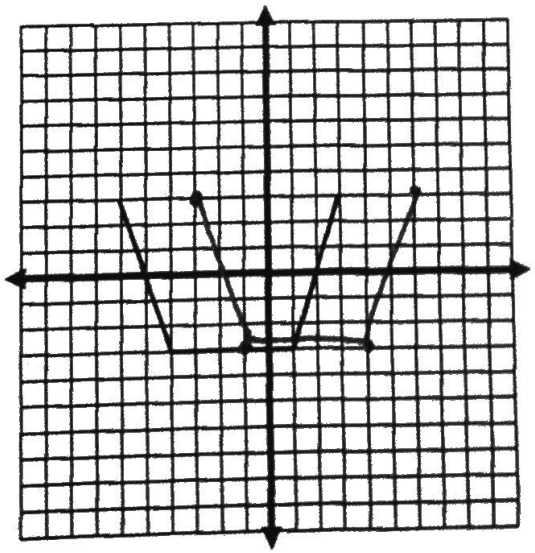
Vertical compression by 1/3



8. $y = 3\,B(x)$ **Vertical stretch by 3**

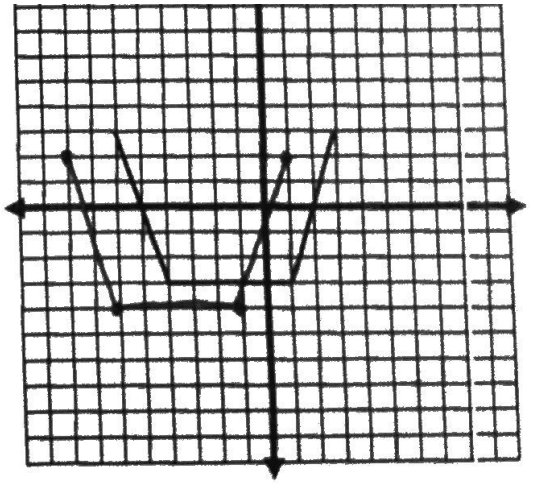


9. $y = B(x-3)$ **Translation right 3**



10. $y = B(x+2) - 1$

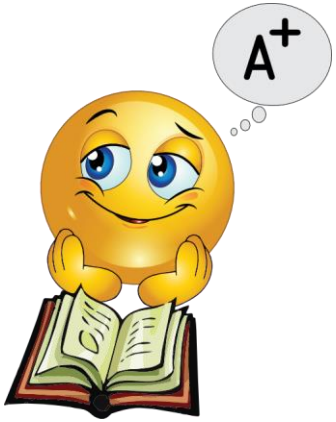
Translation left 2, down 1



Homework

- **Packet Page 17 Odds and #2, 8**
- **Packet p. 18 & 19 ALL**
- **Check Tonight's HW Answers on Bboard**

- **Remember that you must show algebraic work to receive credit! Complete on other paper if needed!**



- **BUT ALSO** – it is not just a good time, but a smart time to start studying. To start reviewing, work on the review homework **Pages 20-24**. It is not due until test day but it is good to start looking at them now!!!! I mean it!

Notes: Solving and Graphing Quadratic Inequalities & Systems

Get out a separate piece of paper to show work!!

Day 11

Solving Quadratic Inequalities
Notes p. 45

Example 1: Solve

$0 > x^2 - 6x - 7$

Steps:

1) Solve to find zeros
2) Place zeros on a number line
   - < or > means non-included point
   - ≤ or ≥ means included point
3) Test a point in each area to determine shading
4) Write answer in set notation! ☺

$0 = (x - 7)(x + 1)$

Zeroes: x = 7 and x = -1

Test a point in each region:

$0 > (-2)^2 - 6(-2) - 7$

$0 \not> 9$ (Do not shade)

$0 > (0)^2 - 6(0) - 7$

$0 > -7$ (Shade)

$0 > (8)^2 - 6(8) - 7$

$0 \not> 9$ (Do not shade)

Answer: **{x | -1 < x < 7}**

Solving Quadratic Inequalities

Example 3: Solve $x^2 - x - 12 \geq 0$

{x| x ≤ -3 or x ≥ 4}

Example 4: Solve $b^2 \geq 10b - 25$

All real numbers

You Try! Solving Quadratic Inequalities

Example 2: Solve $x^2 + 9x + 14 < 0$

{x| -7 < x < -2}

Example 5: Solve $2x^2 + 5x < 12$

{x| -4 < x < -3/2}

Example 6: Solve $n^2 \leq 3$

$\{x | -\sqrt{3} \leq x \leq \sqrt{3}\}$

Linear and Quadratic Systems!

(not in notes….just listen ☺)

$$y = 5x + 6$$

$$y = x + 6$$

This is a System of Linear Equations. Remember, we reviewed how to solve these Algebraically earlier in the course!

When we solve a system of linear equations, what kind of solution do we get? Remember there are 3 possibilities

* A coordinate pair! A point!! ☺
* No solutions (if the lines never intersect)
* Infinite solutions (if the lines coincide)

$$y = x^2 + 5x + 6$$

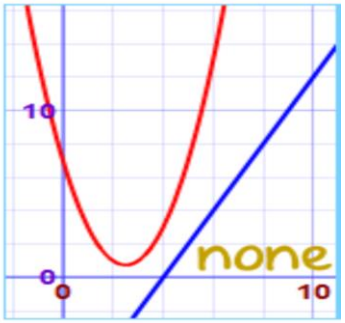
$$y = x + 6$$

This is a System of *Linear and Quadratic* Equations.
More info in your notes next ->

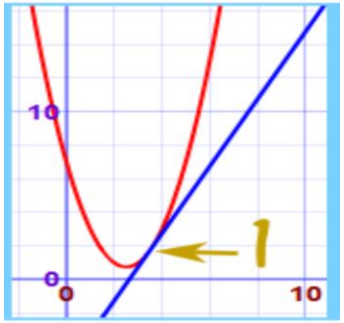
Solving Linear-Quadratic Systems:

With a Linear-Quadratic System, there are three possible cases:

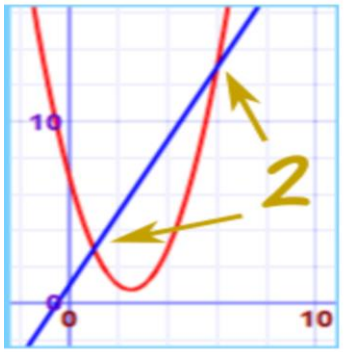
- ___No___ real solution (when the line and the quadratic ___never intersect___)



- ___One___ real solution (happens when ___the line___ just touches the quadratic)



- ___Two___ real solutions (happens when the line and the quadratic intersect ___twice___)



Linear and Quadratic Systems can be solved Graphically and Algebraically!

1) $y = x^2 + 5x + 6$

$y - 6 = x$

As an Honors Student, you need to know how to solve Algebraically! ☺
Let's see the steps!! ->

Solving Linear and Quadratic Systems!

Solving Algebraically! ☺

1) $y = x^2 + 5x + 6$

$y - 6 = x$

Steps:

1) Set the linear equation = y (if this is not done for you already)
2) Since both equations are = y, substitute one equation into the other. Then solve for x.
3) Substitute the x-values back in to find the y-values
4) Your solutions are coordinate points! ☺

There are more ways to solve as well!!

(0, 6) (-4, 2)

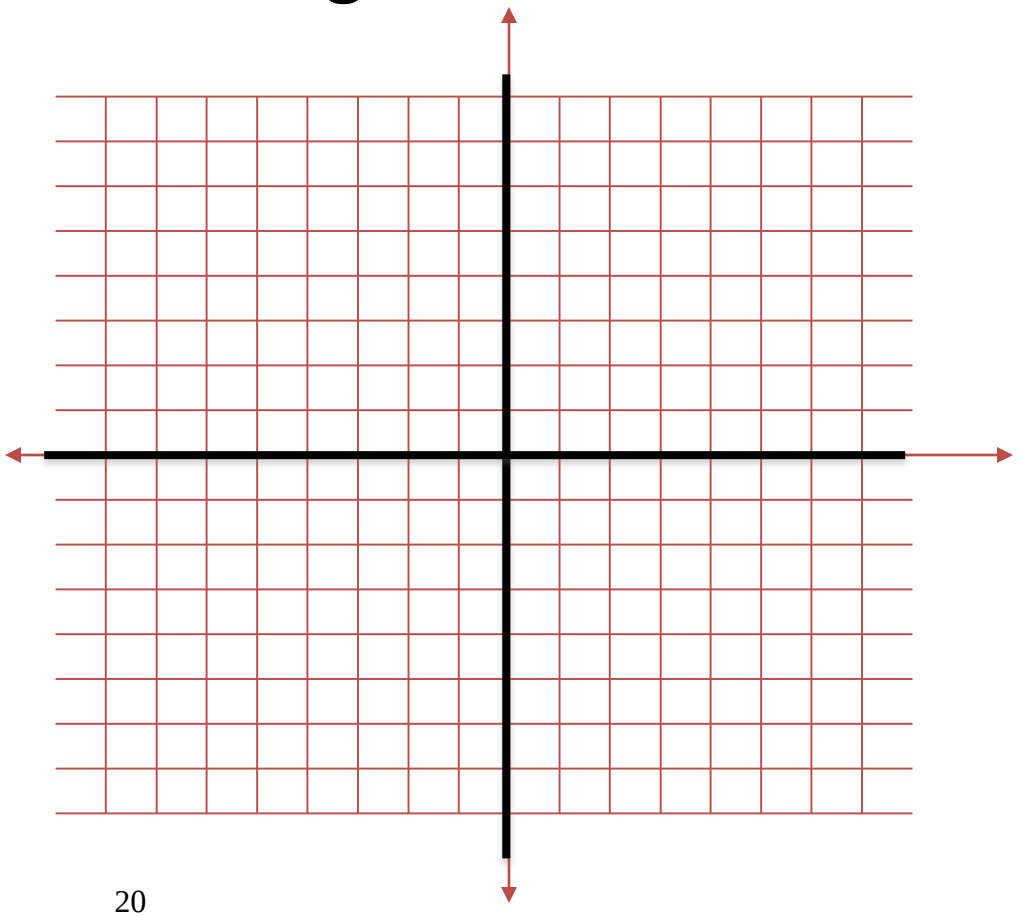
Solving Linear and Quadratic Systems!

These systems can also be solved graphically.

Let's look at #1 again.

1) $y = x^2 + 5x + 6$

$y - 6 = x$



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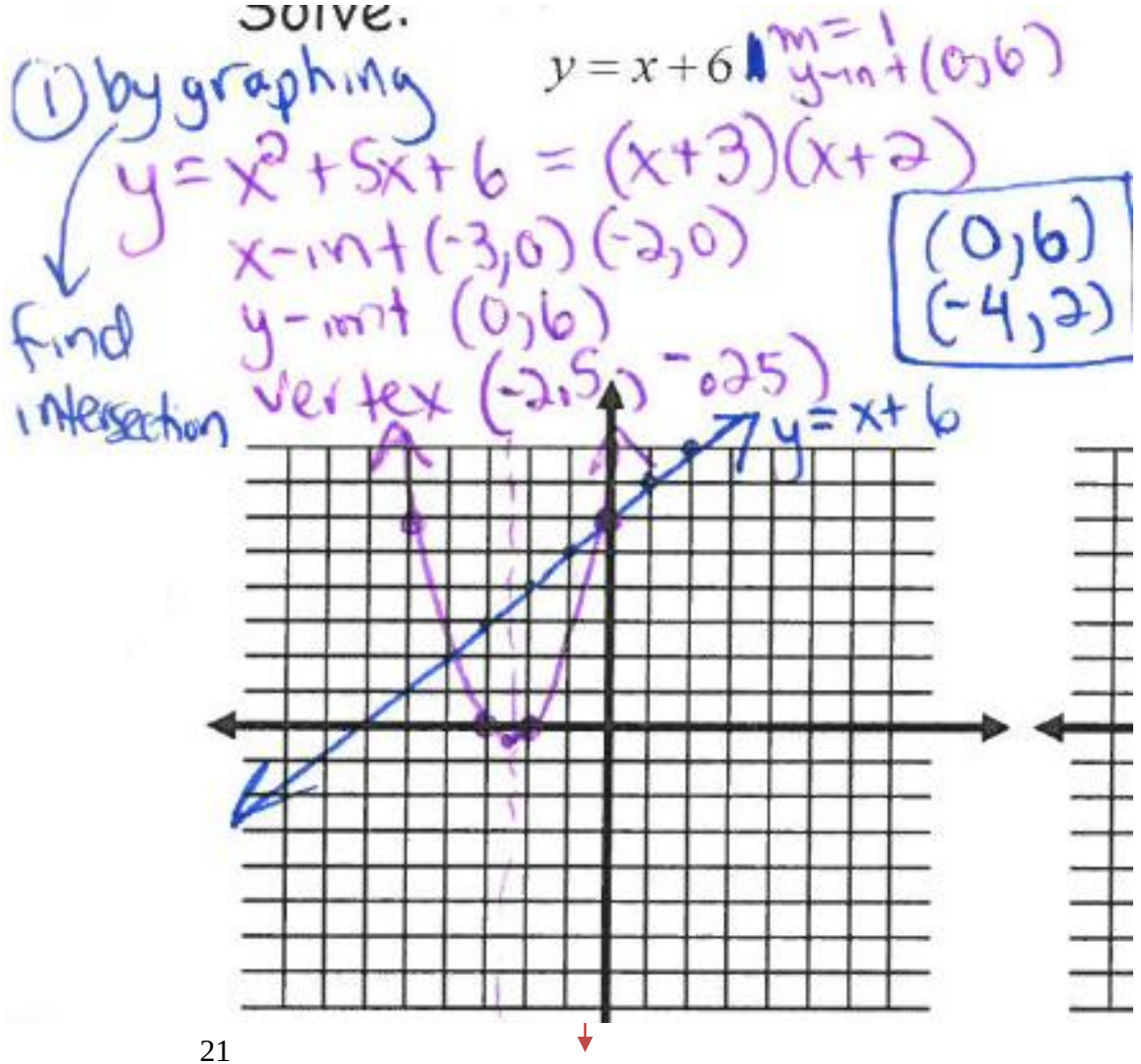


You Try! Solve Algebraically! ☺

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

$y - 2x = -2$

{(4, 6), (-1, -4)}

Linear and Quadratic Systems!

As an Honors Student, you need to know how to solve Algebraically! ☺

3) $x^2 + y^2 = 25$

$4y = 3x$

The Same Steps As Before ☺:

1) Set the linear equation = y (if this is not done for you already)
2) Since both equations are = y, substitute one equation into the other. Then solve for x.
3) Substitute the x-values back in to find the y-values
4) Your solutions are coordinate points! ☺

There are more ways to solve as well!!

{(4, 3), (-4, -3)}

Solving Linear and Quadratic Systems!

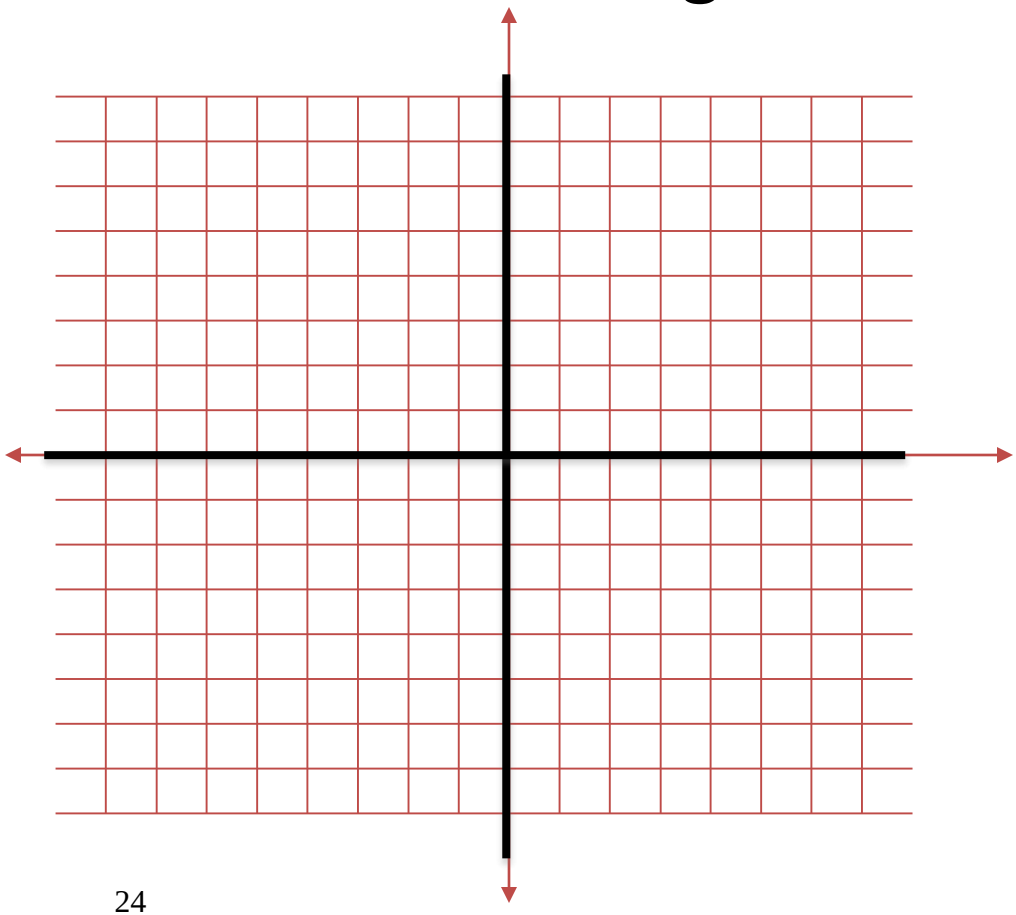
These systems can also be solved graphically.

3) $x^2 + y^2 = 25$

$4y = 3x$

This quadratic is an equation of a circle.

Let's look at #3 again.



Solving Linear and Quadratic Systems!

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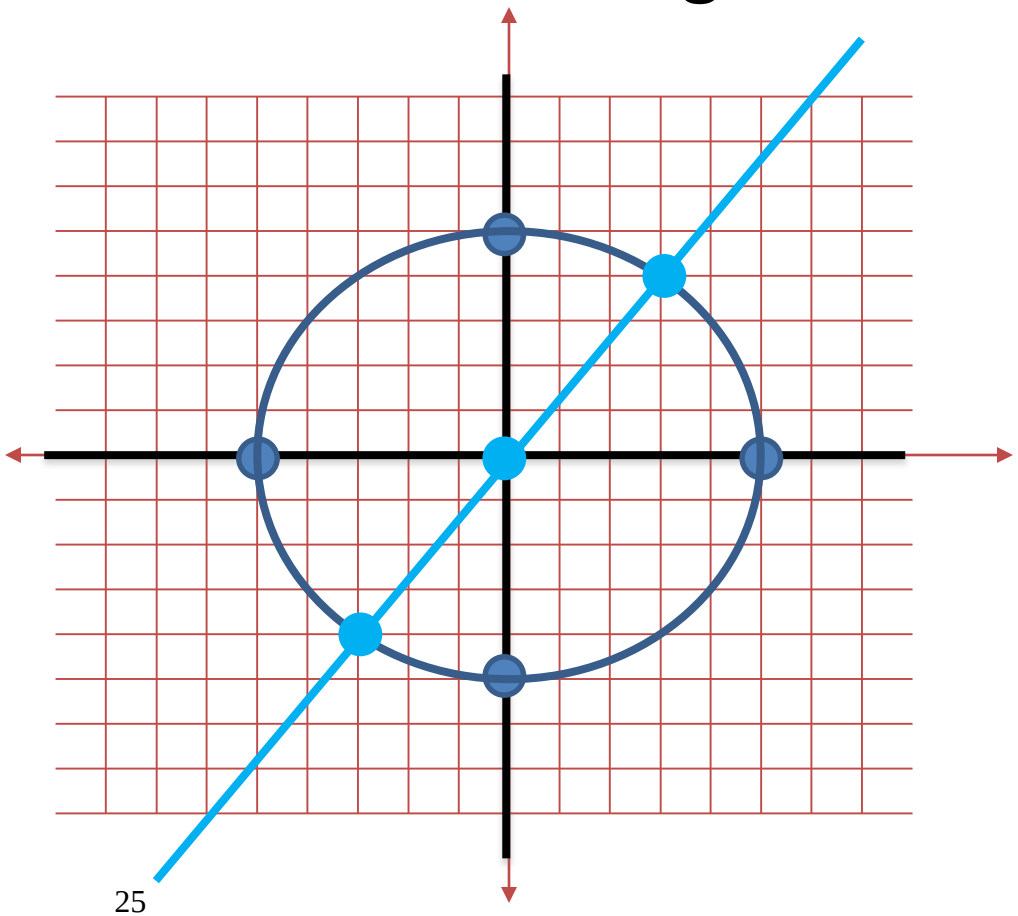


{(4, 3), (-4, -3)}

You Try: Solve Algebraically! ☺

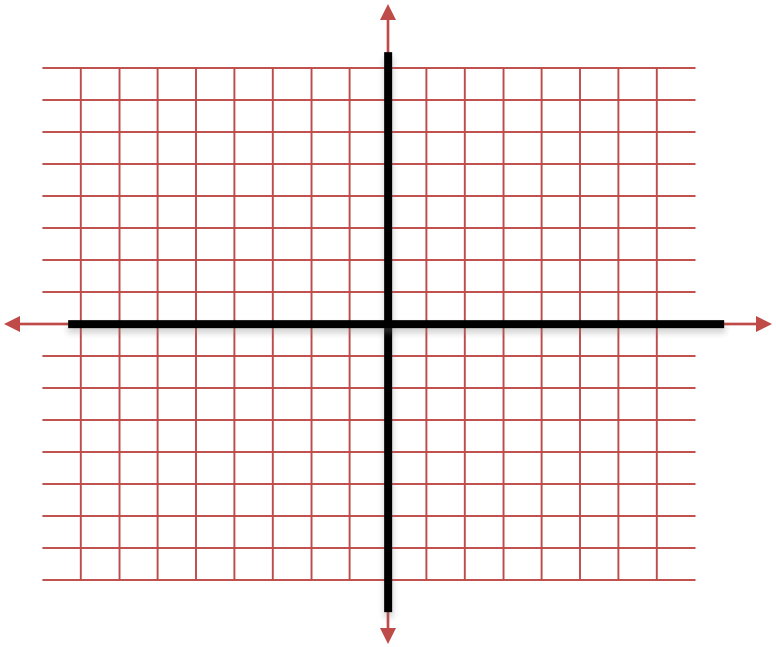
4) $x^2 + y^2 = 26$

$x - y = 6$

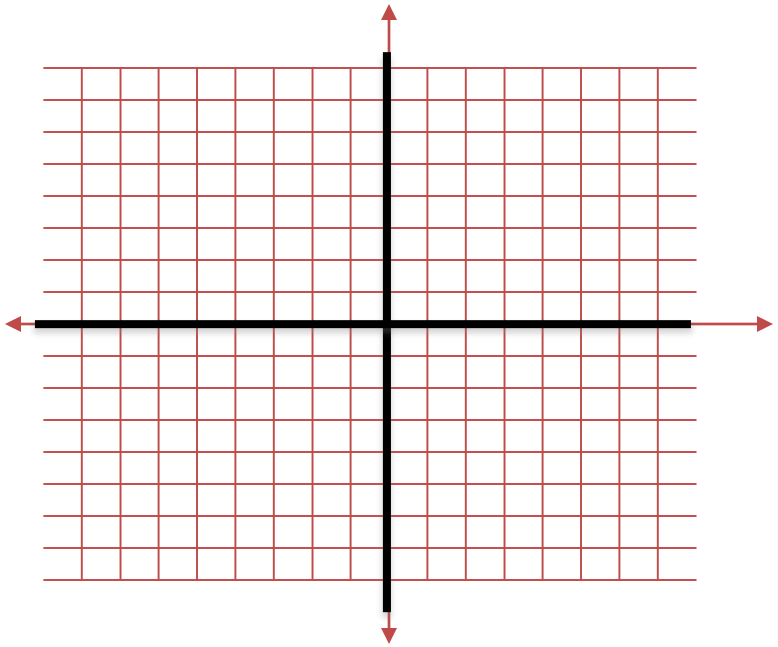
{(5, -1), (1, -5)}

More Practice! Top of p. 47

Graph: 1. $y \geq 2x^2 - 2x - 4$



Graph: 2. $y \leq -x^2 + 2x + 8$



Solve: 3. $x^2 - 3x - 10 < 0$

Solve: 4. $x^2 + 2x \geq 8$

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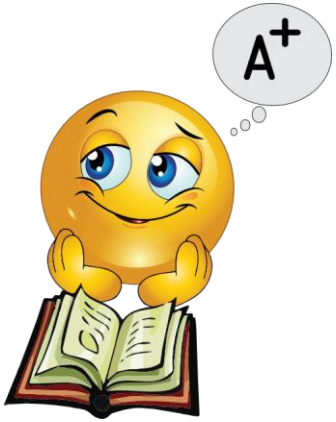

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Applications Practice

Musical Chairs Around the Room Activity

OR

Transformations of Functions Foldable