Unit 6: Formulas and Patterns

Section 6.1: Connect the Dots?

Section 6.2: Equations and Graphs

Section 6.3: Graphing Equations by Plotting Points

Section 6.4: Intercepts

Section 6.5: Horizontal and Vertical Lines

Section 6.6: Looking for Patterns

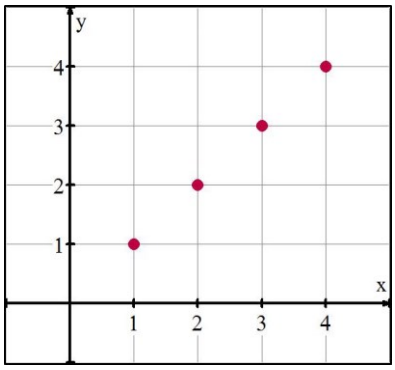
KEY TERMS AND CONCEPTS	
Look for the following terms and concepts as you work through the Media Lesson. In the space below, explain the meaning of each of these concepts and terms *in your own words*. Provide examples that are not identical to those in the Media Lesson.	
Continuous Graph	
Discrete Graph	
The Graph of an Equation	
Horizontal Intercept	

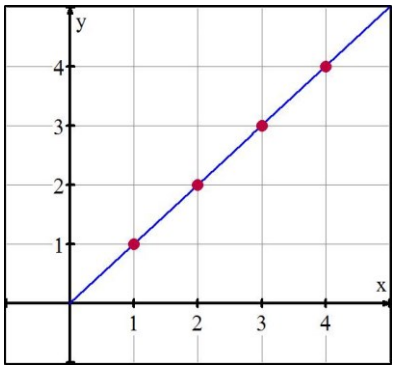
Finding the Horizontal Intercept given an equation	
Vertical Intercept	
Finding the Vertical Intercept given an equation	
Horizontal Line	
Vertical Line	

Unit 6: Media Lesson

Section 6.1: Connect the Dots?

General Notes
• If you are given a table of data, you can only plot those specific values (without connecting them), unless the context defines a *pattern or rate of change* that can be used to accurately define values in between the given data values. • In the media, graphs are often presented as a solid line in order so show a general trend or to make the graph look more appealing. However, not all of the points on the line may make sense in the given situation.



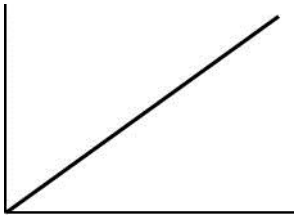


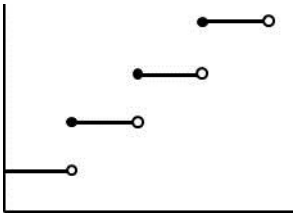
Example 1: Match the stories with the graphs below, and label the axes accordingly.

Story A: Andy is selling snow cones for $3 each. This graph shows the revenue earned from selling the snow cones.

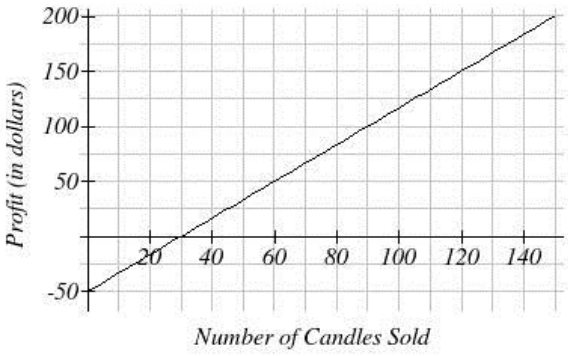
Story B: Andrea is saving money for a trip to Disneyland. Every payday, she sets aside $100 for the trip. She gets paid every two weeks. This graph shows the amount of money saved over time.

Story C: Andrew is walking to school. There are no streets to cross, so he is able to walk at a constant rate. This graph shows Andrew's distance from home over time.





Example 2: Consider the graph below. Do all of the points on the graph make sense in the given situation?



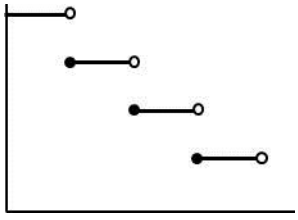
Section 6.1 – You Try

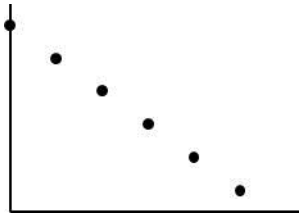
Match the stories with the graphs below, and label the axes accordingly.

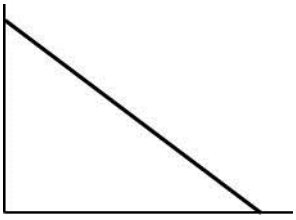
Story A. Water is being drained from a tub. This graph shows the amount of water remaining in the tub (in gallons) after *m* minutes.

Story B. Each ride at a carnival costs $2. This graph shows the amount of money Henry has left over after riding *x* rides.

Story C. An electronics store is offering payment plans with 0% interest. Isabel purchases a laptop and pays $250 on the first of every month to pay it off. This graph represents the remaining balance after *m* months.





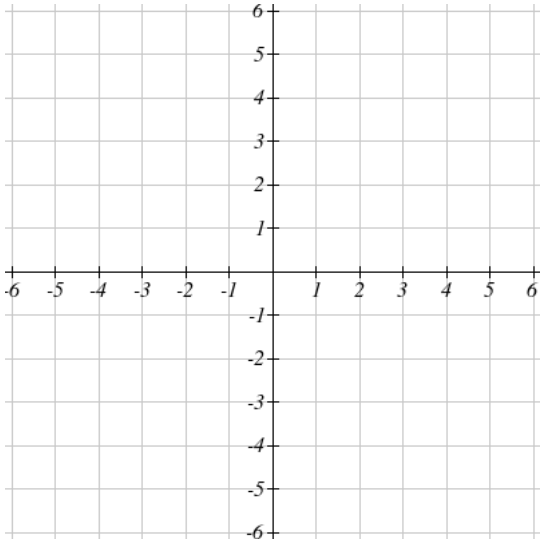


Section 6.2: Equations and Graphs

Definition
The **graph of an equation** is the set of all points for which the equation is true.

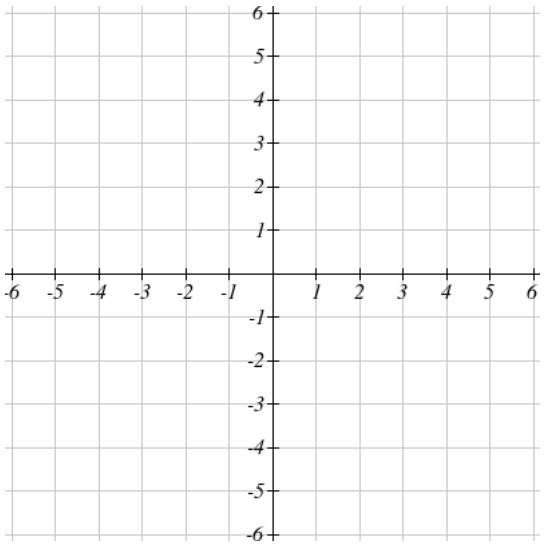
Example 1: Verify that the ordered pairs below satisfy the equation $y = 2x + 3$.

(–2, –1) (0, 3) (1, 5)



Example 2: Verify that the ordered pairs below satisfy the equation $3x + 2y = 6$.

(–2, 6) (0, 3) (2, 0)



Section 6.2 – You Try

Verify that the ordered pairs below satisfy the equation $y = x^2 + 2x - 5$. Show all steps as in the media examples.

(–3, –2) (4, 19) (0, –5)

Section 6.3: Graphing Equations by Plotting Points

Example 1: Use the equation $y = \frac{1}{2}x - 2$ to complete the table below. Graph your results.

x	y	Ordered Pair
-6		
-4		
-2		
0		
2		
4		
6		

Example 2: Use the equation $y = -x^2 + 5$ to complete the table below. Graph your results.

x	y	Ordered Pair
-3		
-2		
-1		
0		
1		
2		
3		

Example 3: Use the equation $y = 2^x$ to complete the table below. Graph your results.

x	y	Ordered Pair
-2		
-1		
0		
1		
2		
3		
4		

Section 6.3 – You Try

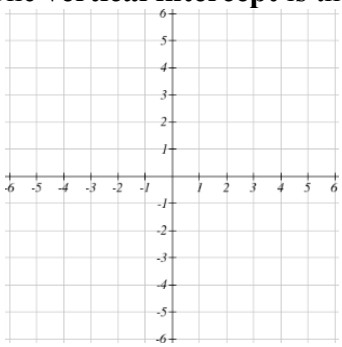
Use the equation $y = |x - 2|$ to complete the table below. Graph your results.

x	y	Ordered Pair
-6		
-4		
-2		
0		
2		
4		
6		

Section 6.4: Intercepts

Vertical and Horizontal Intercepts

The **vertical intercept** is the point at which the graph crosses the vertical axis.

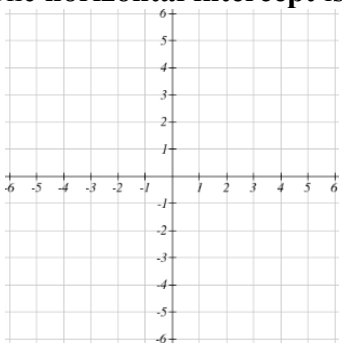


The input value of the vertical intercept is always_____

The coordinates of the vertical intercept will be _____

To determine the vertical intercept:

The **horizontal intercept** is the point at which the graph crosses the horizontal axis.



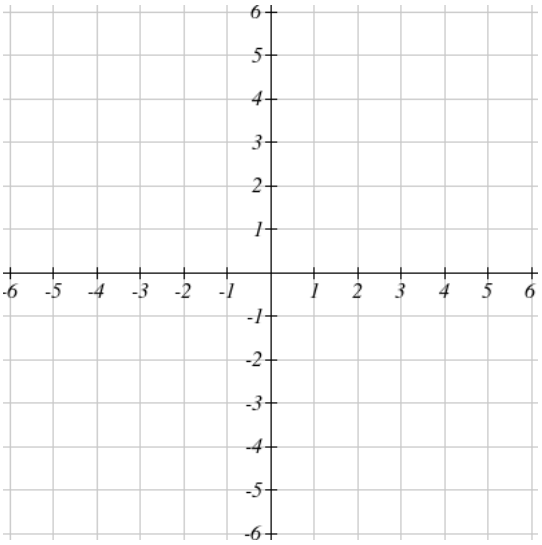
The output value of the horizontal intercept is always_____

The coordinates of the horizontal intercept will be _____

To determine the horizontal intercept:

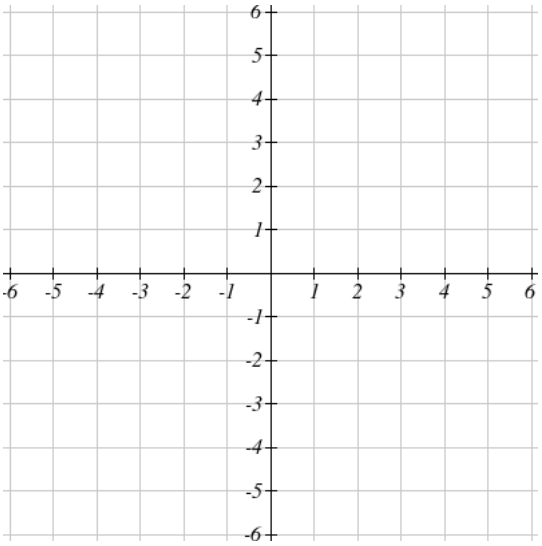
Example 1: Determine the vertical and horizontal intercepts for $y = 3x - 2$.

x	y	Ordered Pair



Example 2: Determine the vertical and horizontal intercepts for $4x - 2y = 10$.

x	y	Ordered Pair



Section 6.4 - You Try

Determine the vertical and horizontal intercepts for $y = 24 - 6x$. Show all steps as in the media examples.

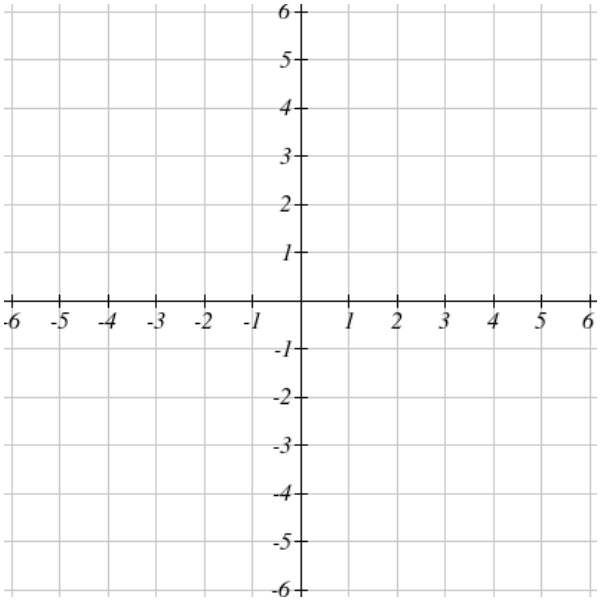
x	y	Ordered Pair

Section 6.5: Horizontal and Vertical Lines

Horizontal Lines $y = b$, where b is a real number

Example 1: Graph the equation $y = 2$

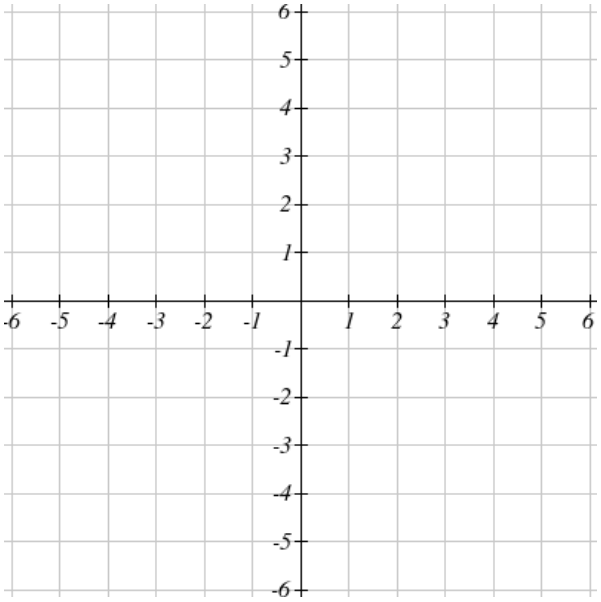
x	y	Ordered Pair



Vertical Lines $x = k$, where k is a real number

Example 2: Graph the equation $x = -3$

x	y	Ordered Pair

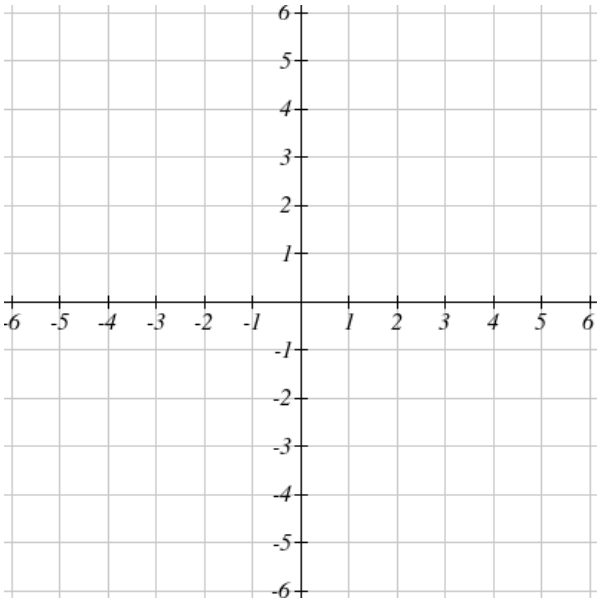


Section 6.5 - You Try

Complete the problems below.

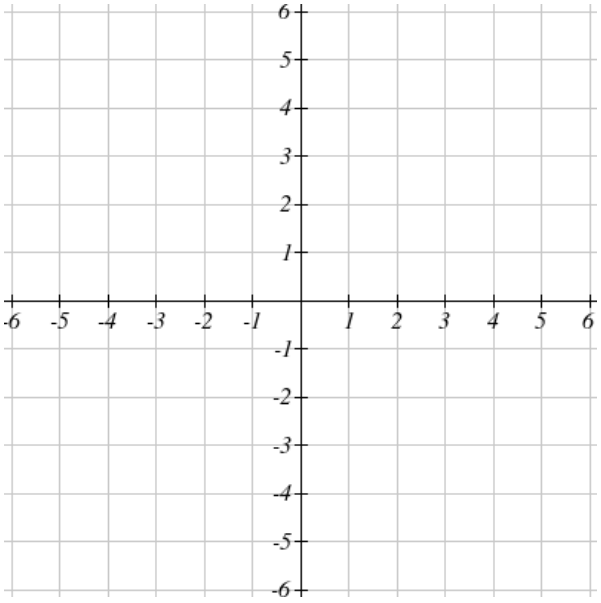
a. Graph the equation $y = -2$

x	y	Ordered Pair



b. Graph the equation $x = 4$

x	y	Ordered Pair



Section 6.6: Looking for Patterns

Example 1: Determine the pattern and complete the table. Graph the results, and write a formula to describe the relationship between the input and output variables.

x	y	Ordered Pair
-3		
-2	3	
-1	4	
0	5	
1		
2		
3	8	

Symbolic Rule:

_____

Example 2: Determine the pattern and complete the table. Graph the results, and write a formula to describe the relationship between the input and output variables.

x	y	Ordered Pair
–3		
–2	–1	
–1	–½	
0	0	
1	½	
2	1	
3		

Symbolic Rule:

_____

Example 3: Determine the pattern and complete the table. Graph the results, and write a formula to describe the relationship between the input and output variables.

x	*y*	Ordered Pair
–3	9	
–2	4	
–1		
0	0	
1	1	
2		
3	9	
4	16	

Symbolic Rule:

_____

Section 6.6 – You Try

Determine the pattern and complete the table. Graph the results, and write a formula to describe the relationship between the input and output variables.

x	*y*	Ordered Pair
-3	6	
-2	4	
-1	2	
0		
1	–2	
2	–4	
3		

Symbolic Rule:

_____

Name: _____ Date: _____

Unit 6: Practice Problems

Skills Practice

1. Which of the following ordered pairs satisfy the equation $y = -2x - 4$? **Circle all that apply, and show all supporting work.**

(9, –22) (6, –5) (–9, 14) (2, 0) (–4, 0)

2. Which of the following ordered pairs satisfy the equation $3x - 2y = 8$? **Circle all that apply, and show all supporting work**

(2, –1) (–4, 0) (1, 8) (–2, –7) (–16, –8)

3. Which of the following ordered pairs satisfy the equation $y = 1 - x$. **Circle all that apply, and show all supporting work**

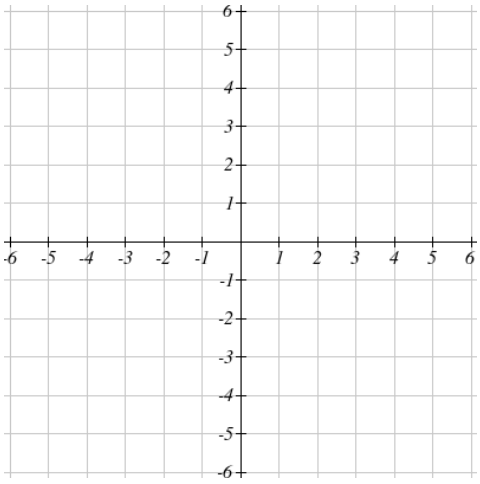
(–7, 8) (0, 1) (3, –2) (–1, 0) (–20, 21)

4. Which of the following ordered pairs satisfy the equation $y = -2x$. **Circle all that apply, and show all supporting work**

(6, –12) (–1, 2) (4, –8) (0, –2) (0, 0)

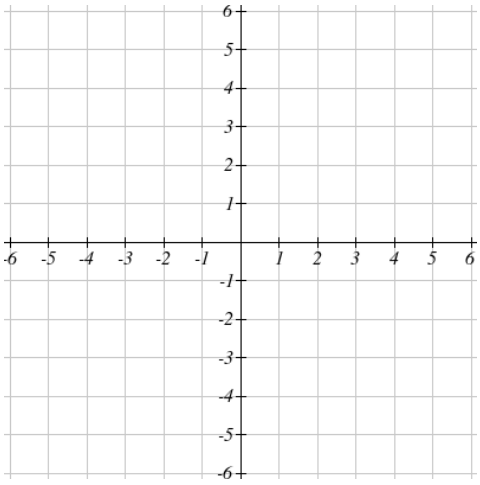
5. Graph the equation $y = -4x + 2$.

x	y	Ordered Pair



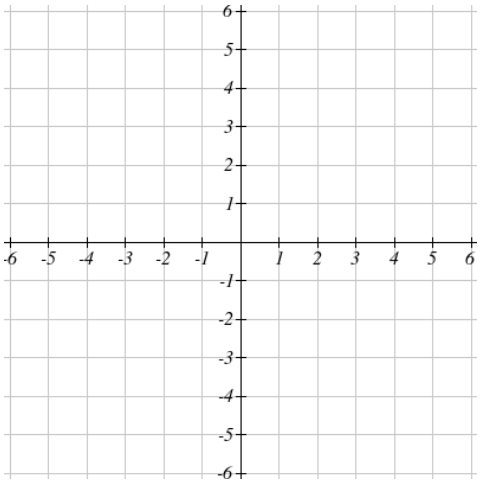
6. Graph the equation $y = \frac{2}{5}x - 3$

x	y	Ordered Pair



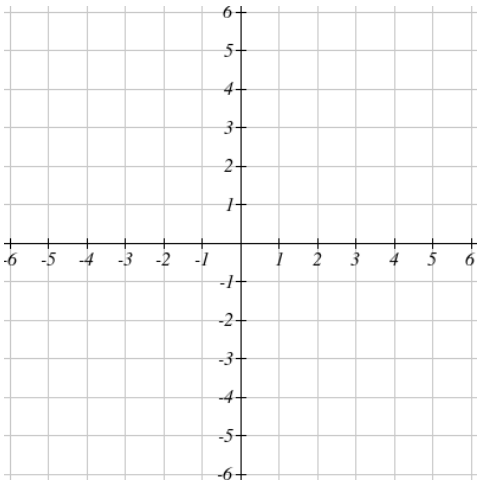
7. Graph the equation $y = 3 - x$.

x	y	Ordered Pair



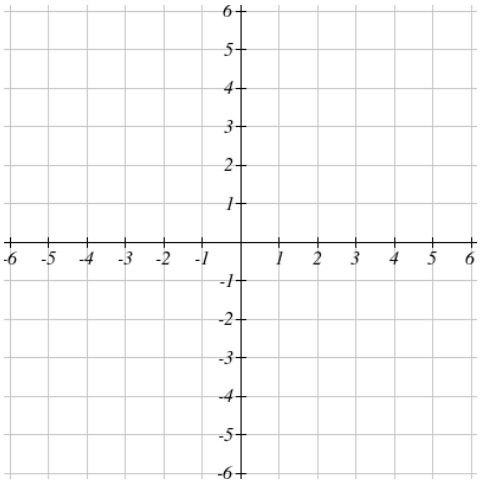
8. Graph the equation $4x - 2y = 12$.

x	y	Ordered Pair



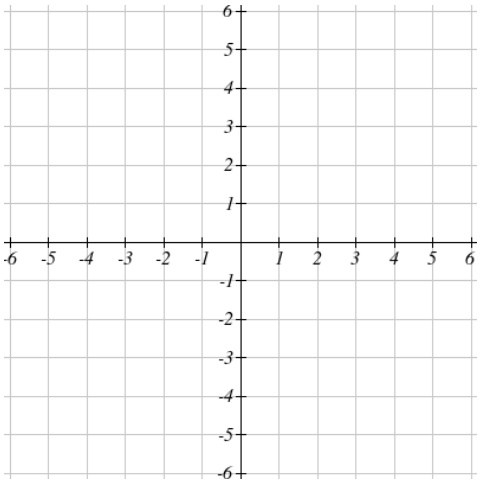
9. Graph the equation $x - y = 4$.

x	y	Ordered Pair



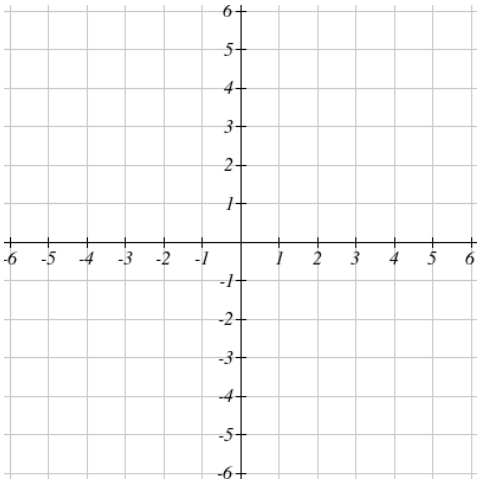
10. Graph the equation $y = x$.

x	y	Ordered Pair



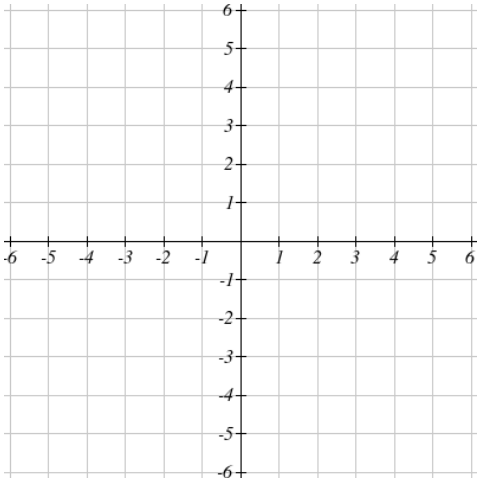
11. Graph the equation $y = \frac{2}{3}x$.

x	y	Ordered Pair



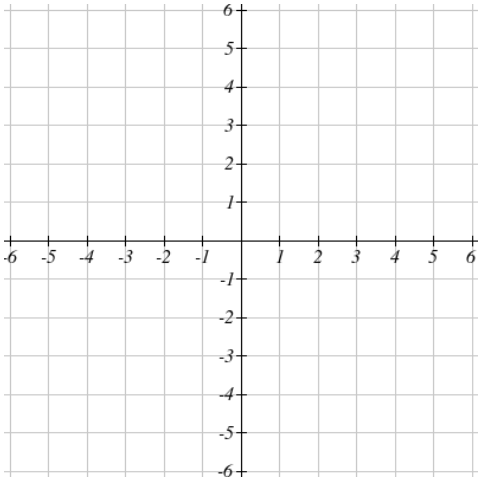
12. Graph the equation $y = -4$.

x	y	Ordered Pair



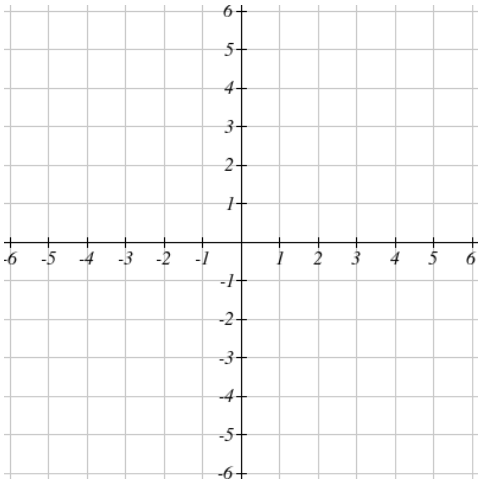
13. Graph the equation $x = 3$

x	y	Ordered Pair



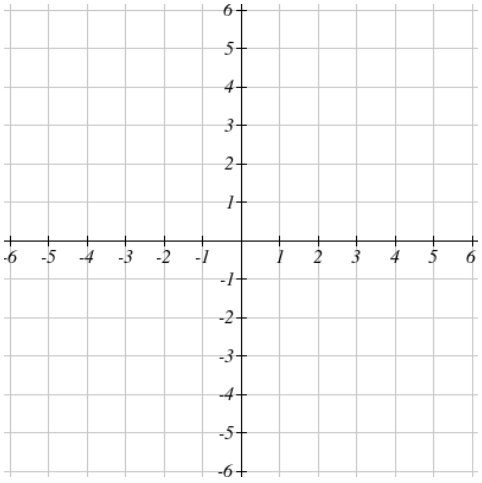
14. Graph the equation $y = 5 - x^2$

x	y	Ordered Pair
-3		
-2		
-1		
0		
1		
2		
3		



15. Graph the equation $y = |x + 2|$

x	y	Ordered Pair



16. Use the equation $y = 3^x$ to complete the table below. Graph your results.

x	y	Ordered Pair
-2		
-1		
0		
1		
2		
3		
4		

17. Complete the table below. Write the intercepts as ordered pairs.

Equation	Vertical Intercept	Horizontal Intercept
$y = 5x - 3$		
$y = 4 - x$		
$y = 4x$		
$y = 3$		
$5x + 6y = 12$		
$3x - 4y = 24$		
$x - 2y = 8$		
$x = 5$		

18. Determine the pattern and complete the table. Graph the results, and write a formula to describe the relationship between the input and output variables.

x	*y*	Ordered Pair
-3	30	
-2	20	
-1	10	
0		
1	-10	
2		
3	-30	

Symbolic Rule:

_____

19. Determine the pattern and complete the table. Graph the results, and write a formula to describe the relationship between the input and output variables.

x	*y*	Ordered Pair
-3	-11	
-2	-10	
-1		
0	-8	
1		
2	-6	
3	-5	

Symbolic Rule:

_____

20. Determine the pattern and complete the table. Graph the results, and write a formula to describe the relationship between the input and output variables.

x	*y*	Ordered Pair
-3	-27	
-2	-8	
-1	-1	
0	0	
1		
2		
3	27	

Symbolic Rule:

_____

21. Determine the pattern and complete the table. Graph the results, and write a formula to describe the relationship between the input and output variables.

x	*y*	Ordered Pair
-3	-5	
-2		
-1	-1	
0		
1	3	
2	5	
3	7	

Symbolic Rule:

_____

Applications

22. Jordan is saving money for emergencies (or a trip to Europe). She has $420 under her mattress, and is adding $60 to it each week.

a. Let A represent the total amount of money under her mattress, and w represent the number of weeks. Write an algebraic equation to represent this situation.

b. Use the equation in part a. to complete the table below.

w	0	8			37	
A			1800	2220		3000

c. Interpret the meaning of the ordered pair (18, 1500).

d. Identify the vertical intercept in this situation. Write it as an ordered pair and interpret its meaning in a complete sentence.

e. How much money will Jordan have saved after 3 weeks?

f. Calculate the horizontal intercept for the equation you found in part a. and write it as an ordered pair. Does this point make sense in the given situation? Why or why not?

23. Jill is planning to sell bottled water at the local carnival. She buys 10 packages of water (240 bottles) for \$66 and plans on selling the bottles for \$1.50 each. Jill's profit, P in dollars, from selling b bottles of water is given by the formula $P = 1.50b - 66$.

a. Complete the table below.

b	0	50	100	200
P				

b. Interpret the meaning of the ordered pair (84, 60).

c. Identify the vertical intercept. Write it as an ordered pair and interpret its meaning in a complete sentence.

d. Determine the horizontal intercept. Write it as an ordered pair and interpret its meaning in a complete sentence.

e. Use the values in the table to construct a properly scaled and labeled graph of this equation.

24. Match the stories with the graphs below, and label the axes accordingly.

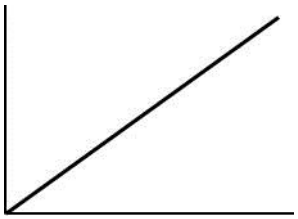
Story A: Heidie is filling a pool with water. This graph shows the amount of water in the pool (in gallons) over time.

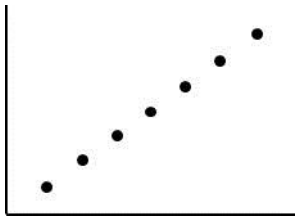
Story B: John has $15,000 in his bank account for college. Every semester, he withdraws $3000 to pay for tuition and fees. This graph shows the remaining balance in his bank account over time.

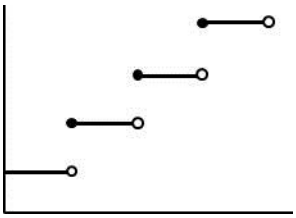
Story C: A caterer charges $12.50 per guest at a reception. This graph shows the cost for food at the reception, based on the number of guests attending.

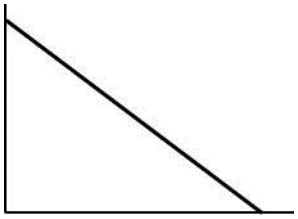
Story D: A car comes to a stop at a red light. This graph shows the speed of a car over time.

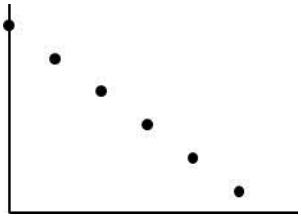
Story E: Nik must complete all obstacles at each level of his video game before moving up to the next level. If he does not pass all obstacles, he has to restart at the beginning of the level. This graph shows Nik's progress in the video game over time.

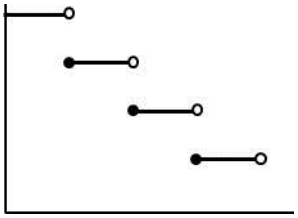












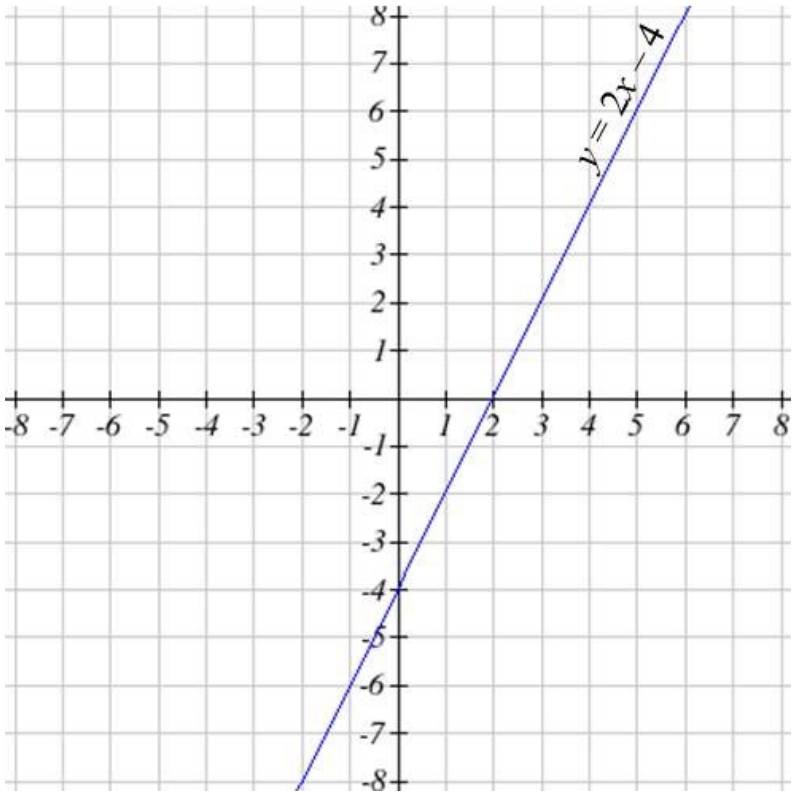
After matching all of the stories with their graphs, there should be one graph remaining. In the space below, write a story that corresponds to the remaining graph. Label the axes accordingly.

Extension

25. Which of the following ordered pairs satisfy the **inequality** $y < 2x - 4$? Select all that apply and plot the selected points on the graph below.

(–5, 2) (4, 1) (3, –6) (0, 0) (6, 4)

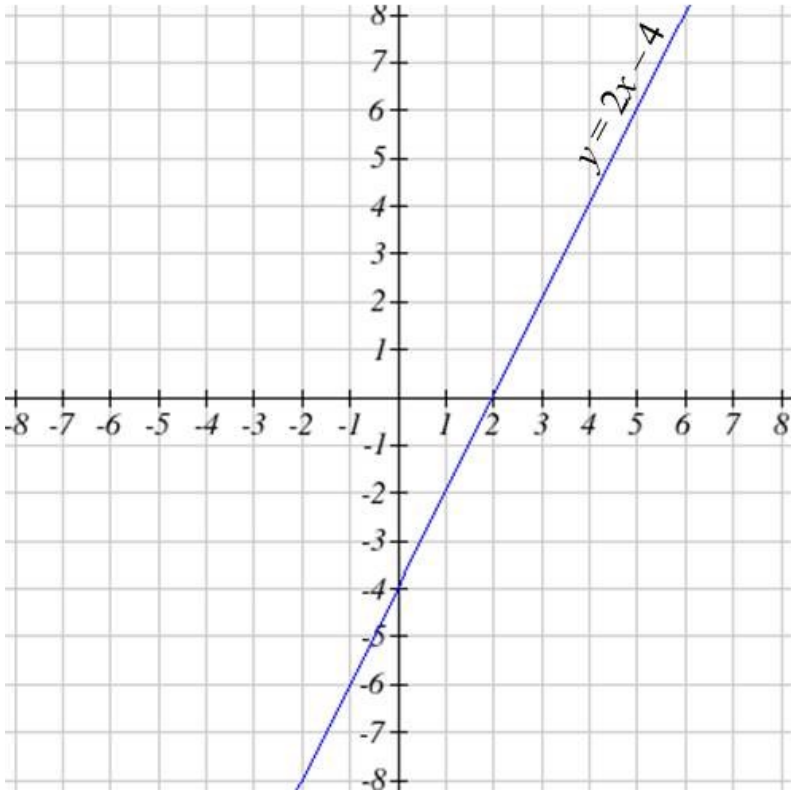
(7, 0) (1, –8) (–5, 6) (2, 0) (7, –5)



26. Which of the following ordered pairs satisfy the **inequality** $y \geq 2x - 4$? Select all that apply and plot the selected points on the graph below.

(–5, 2) (4, 1) (3, –6) (0, 0) (6, 4)

(7, 0) (1, –8) (–5, 6) (2, 0) (7, –5)

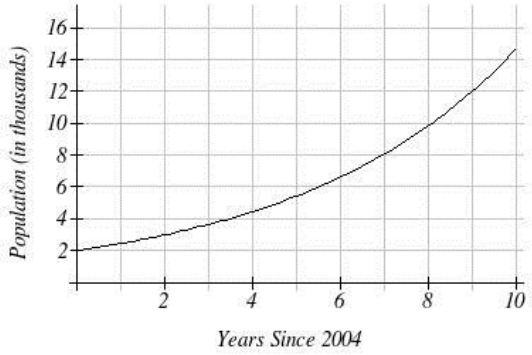


27. In your own words, describe the distinction between a *continuous* graph and a *discrete* graph.

28. In your own words, describe the distinction between *continuous* data and *discrete* data.

29. In your own words, describe the distinction between a *continuous* variable and a *discrete* variable.

30. Consider the graph below. Do all of the points on the graph make sense in the given situation? Explain.



Name: _____ Date: _____

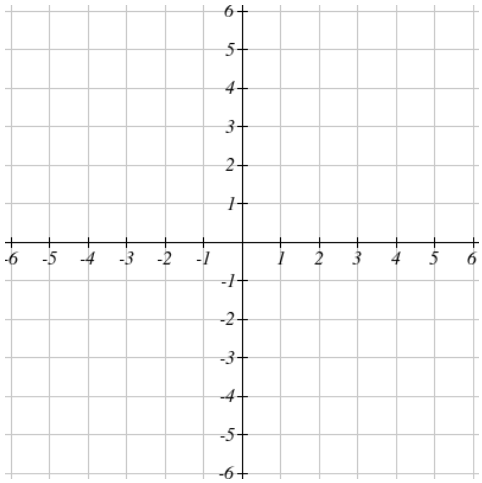
Unit 6: Review

1. Which of the following ordered pairs satisfy the equation $y = x^2 - 3$. **Circle all that apply, and show all supporting work**

(1, 2) (4, 13) (–3, –9) (–5, 22)

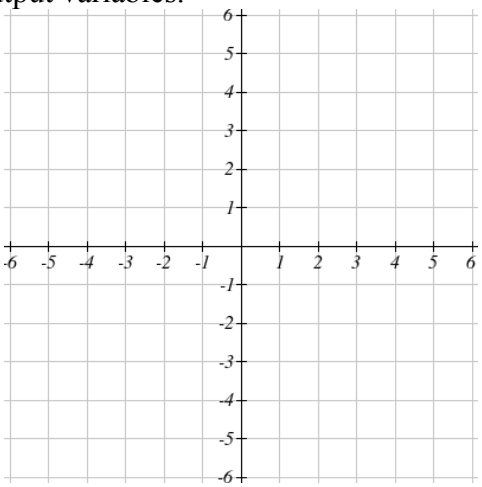
2. Graph the equation $x = -2$

x	y	Ordered Pair



3. Determine the pattern and complete the table. Graph the results, and write a formula to describe the relationship between the input and output variables.

x	y	Ordered Pair
–3	–5	
–2	–4	
–1	–3	
0		
1	–1	
2	0	
3		



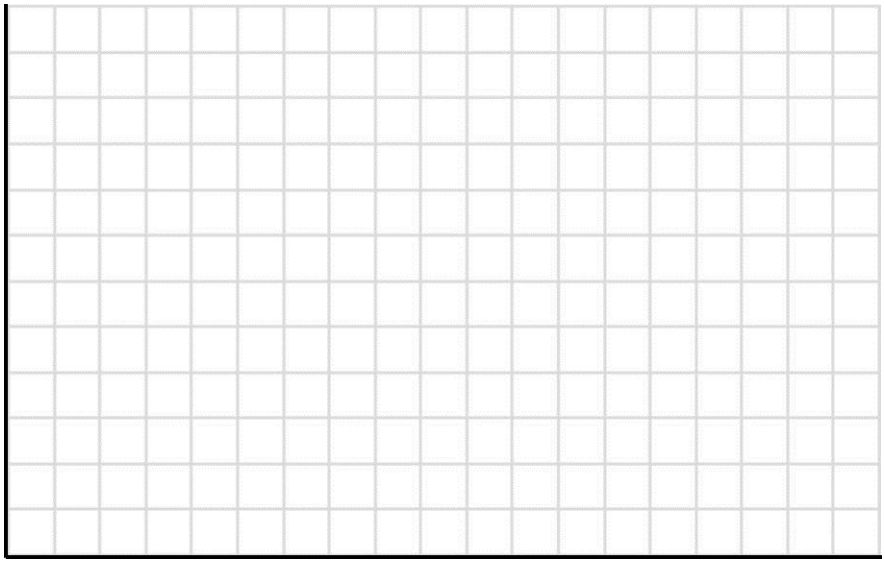
Symbolic Rule:

_____

4. The maximum heart rate is the highest heart rate achieved during maximal exercise. In general, you get the most benefits and reduce the risks when you exercise near your *target* heart rate. Usually this is when your exercise heart rate (pulse) is about 80% percent of your maximum heart rate. For adults 19 years of age and older, the formula $T = 176 - 0.8a$, gives the target heart rate, T, in beats per minute, for a person who is a years of age.

   a. Complete the table below.

Age (years)	20	25	38		70
Target Heart Rate (bpm)	160	156	145.6	132	

   b. In a complete sentence, interpret the meaning of the ordered pair (25, 156).

   c. Use the values in the table to construct a properly scaled and labeled graph of this equation.