Module 2 Introducing Linear Equations

Section 2.1 Understanding Graphs
Practice Problems 2.1
For Problem 1, explain the story of the given graph.

1.
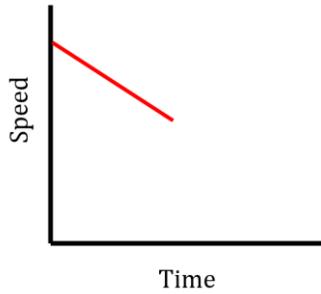
For Problem 2-7, draw the graph of the story given. Assume all rates are constant.

2.   A plane is ready to land and is circling the airport at the same height; it is waiting for an open runway. Time keeps moving on while the plane stays the same distance from the airport.
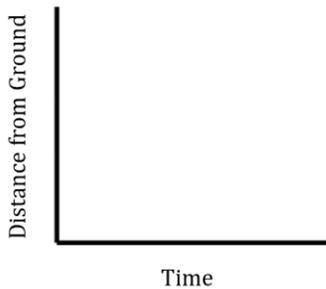
3.   Colby is playing on the slide. He climbs up the steps, then stops at the top for a few seconds. Then he goes down the slide holding onto the sides until he lands.
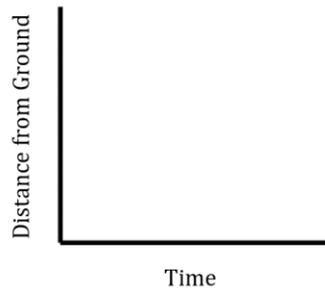
4.   Jaelynn jogs farther and farther away from her house, jogging at a steady rate. She stops at a bridge to watch the sunset.
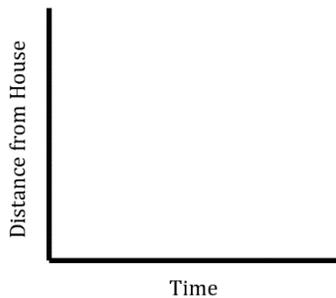
5.   Grandma is filling a cup with water to make hot cocoa.
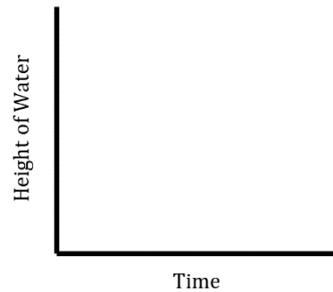
6.   Jillian is walking to the library from home at a constant rate. She stops to look at a butterfly for a few seconds, and then continues walking to the library.
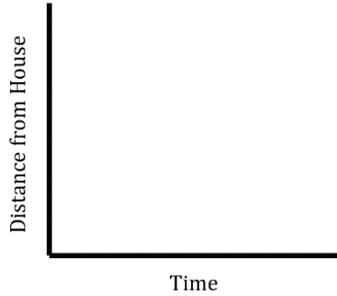
7.   Joey drives into the school parking lot at 15 mph. He stops in the parking lot a little way from the building to let students enter the school. He then continues at 15 mph until he parks in front of the school.
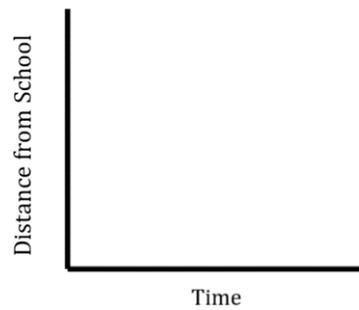
For Problem 8 and 9, explain the story of the graph given.

8.
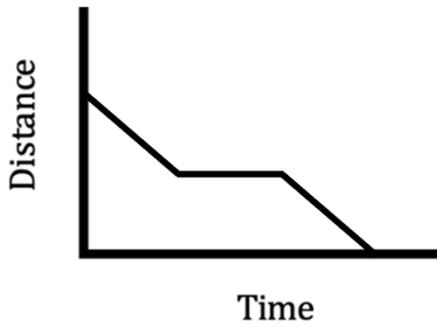
9.
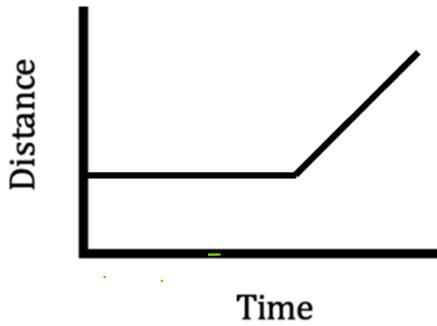
For Problem 10, find a partner to play "Where is High Hat Hiding?" Use the game board below.
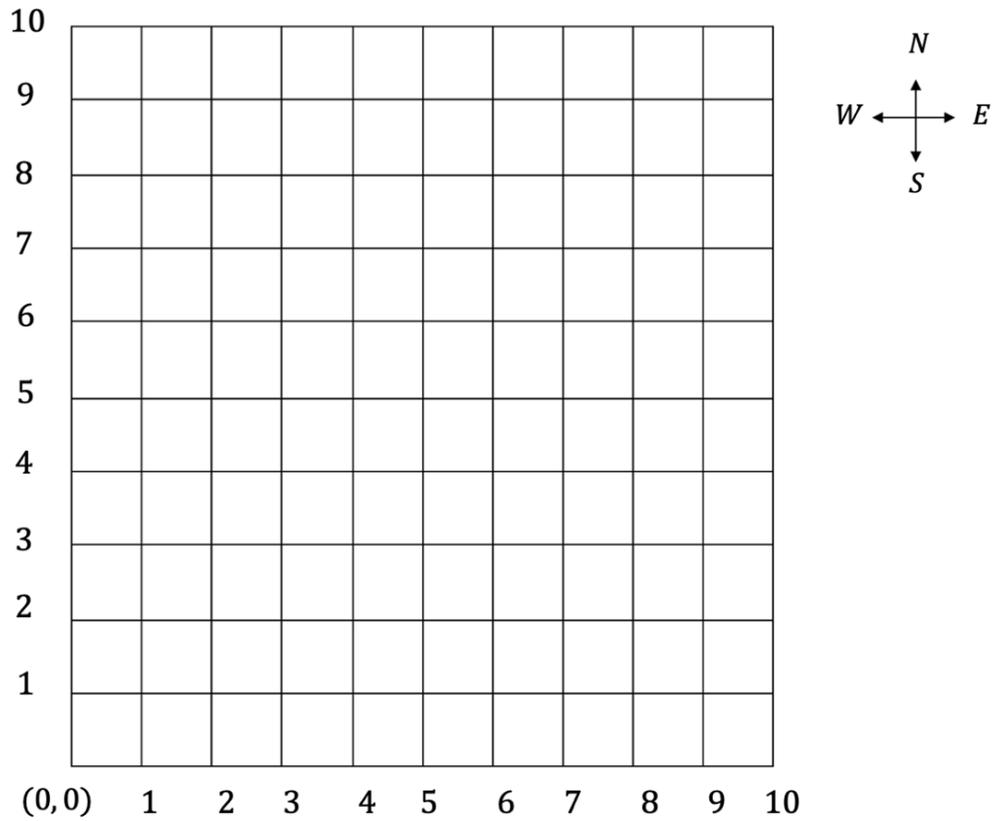
Guess										
Hint										

<u>Section 2.2 Graphing Ordered Pairs</u>
<u>Practice Problems 2.2</u>
For Problem 1-6, use the given graph to solve the problem. (Each square is 1 unit.)
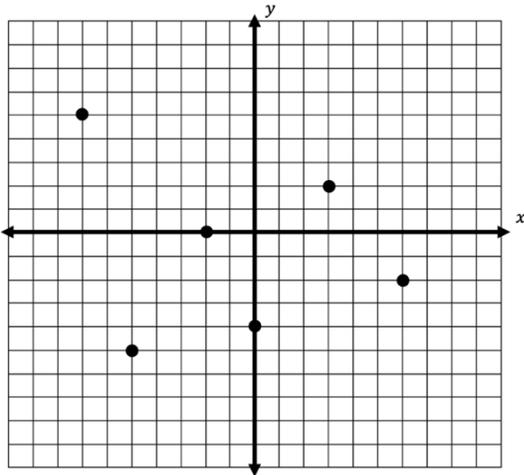
1. Which dot is the ordered pair in Quadrant I?

2. Which dot is the ordered pair on the y-axis?

3. Which dot is the ordered pair in Quadrant IV?

4. Which dot is the ordered pair in Quadrant II?

5. Which dot is the ordered pair that is the x-intercept?

6. Which dot is the ordered pair in Quadrant III?

For Problem 7-15, use the given graph to plot the ordered pairs and then answer the questions. (Each square is 1 unit.)
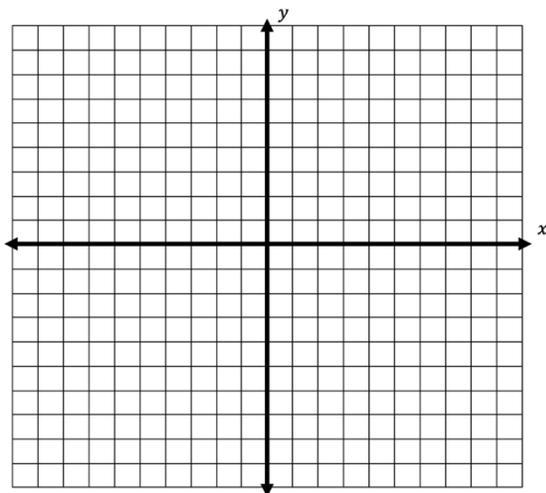
7. Plot the point $(4, 5)$.

8. Plot the point $(-4, -5)$.

9. Plot the point $(-8, 1)$.

10. Plot the point $(-8, 0)$.

11. Plot a point at the origin.

12. Plot the point $(0, -8)$.

13.   What is the ordered pair at the origin?

14.   Which ordered pair is the y-intercept? Which axis is it on?

15.   Which ordered pair is on the x-axis? What intercept is it called?

4

<u>Section 2.3 Input-Output Tables</u>
<u>Practice Problems 2.3</u>
For Problem 1-3, complete the Input-Output table given and tell the rule to solve the problem.

1.

Input	Output
b	B
	C
d	
i	
j	J
k	K
	P
q	Q
r	

2.

Input	Output
4	10
5	11
	12
7	
10	
11	
12	

3.

Input	Output
65	55
55	45
45	35
	25
25	
15	
	-5

For Problem 4-6, answer the question given.

4.   When the input is 2, the output is 14. When the input is 5, the output is 35. When the input is 8, the output is 56. What is the rule?

5.   When the input is 2, the output is 4. When the input is 3, the output is 9. When the input is 4, the output is 16. What is the rule?

6.   When the input is 2, the output is 4. When the input is 4, the output is 10. When the input is 6, the output is 16. What is the rule?

For Problem 7-10, use the rule to complete the Input-Output function table given.

7.

Rule: 3(Input) − 12	
Input	Output
−2	
0	
2	
4	
6	

8.

Rule: $\frac{2}{3}$(Input)	
Input	Output
−2	
0	
2	
4	
6	

9.

Rule: 8 − 2(Input)	
Input	Output
−2	
0	
2	
4	
6	

10.   In the Input-Output tables for Problem 7-9, as the input increases by 1, what does the output increase by?

Section 2.4 Introducing Linear Equations
Practice Problems 2.4

For Problem 1-6, tell which is the independent variable and which is the dependent variable of the phrases given.

1.   The amount of snow you get in the winter in Colorado

        How dry the conditions are in the winter in Colorado

2.   How many materials you put in the box

        The weight of the box of materials

3.   Weight of the Volkswagen

        Number of students stuffed in the Volkswagen

4.   The number of days fertilizer has been added to the plant

        The height of the plant

5.   The number of bacteria in the petri dish

        The number of days the bacteria are in the petri dish

6.   The speed at which the anchor drops

        The amount of weight on the anchor

For Problem 7-12, tell whether the table, graph, or equation is linear or non-linear.

7. $y = x^2 + 8$ 8.

x	y
-1	-2
0	0
1	2
2	4

9.
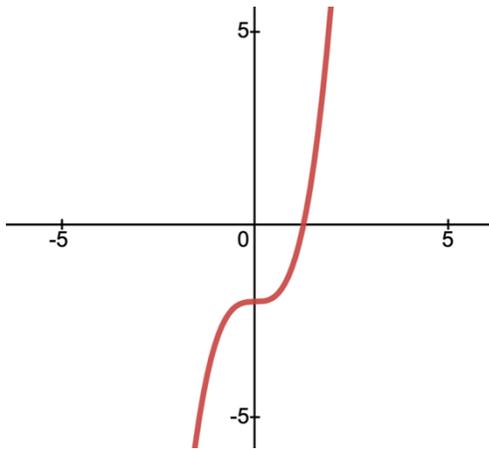
10.

x	y
-1	3
0	4
1	6
2	9

11. $y = -5x + 4$

12.
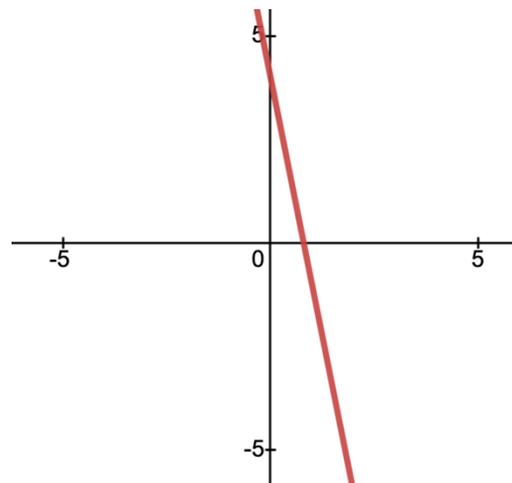
Section 2.5 Graphing an Equation Using a Table
Practice Problems 2.5
For Problem 1-7, complete the table given and draw the graph of the equation.

1.

$y = 3x + 2$	
x	y
-1	
0	
1	
2	
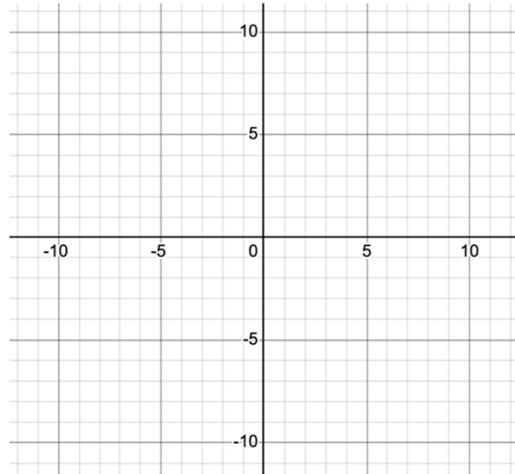
2.

$y = -6x + 1$	
x	y
-1	
0	
1	
2	
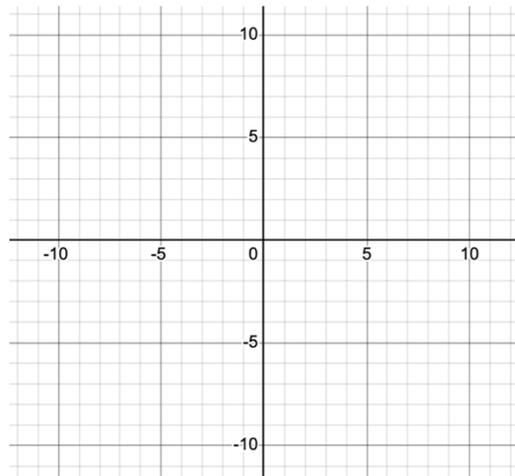
3.

$y = \dfrac{2}{3}x + 6$	
x	y
-3	
0	
3	
6	
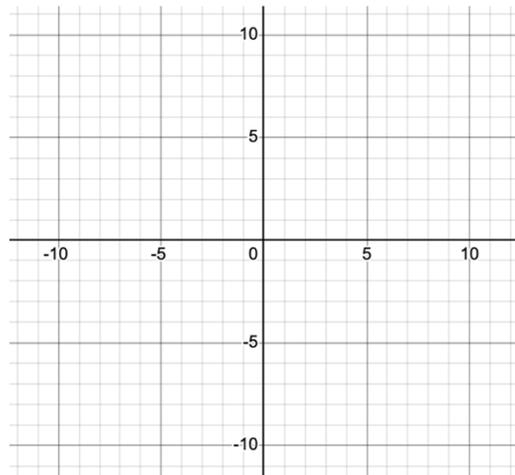
4.

$y = -4x$	
x	y
-1	
0	
1	
2	
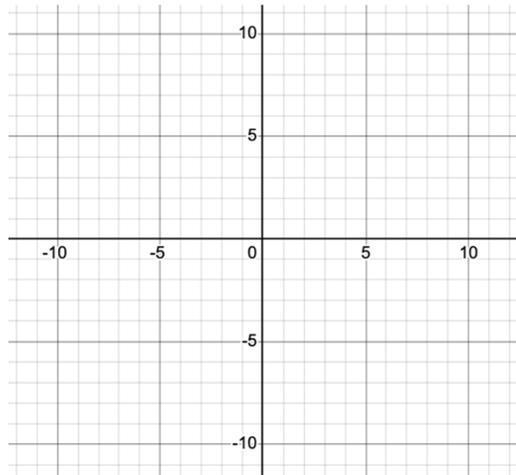
5.

$y = 5 - 3x$	
x	y
-1	
0	
1	
2	
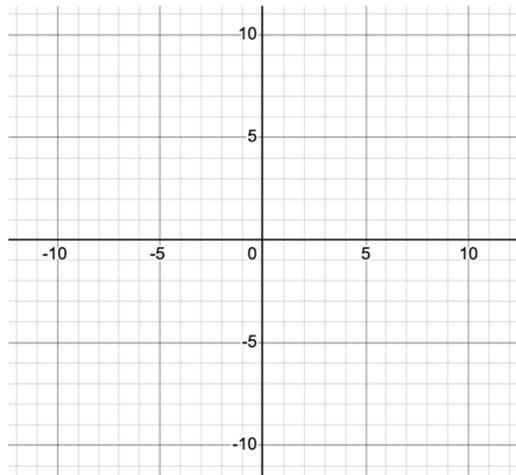
6.

$x = 3$	
x	y
	1
	2
	3
	4
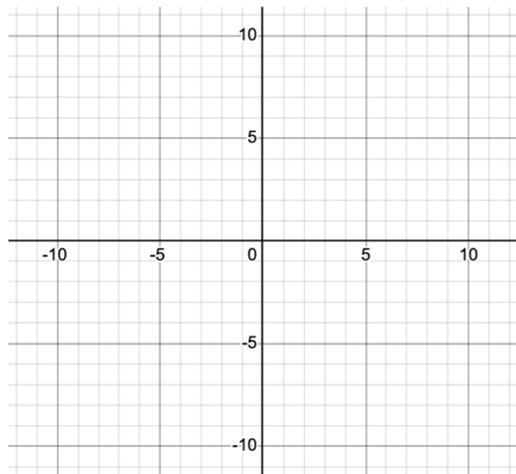
7.

$y = -2$	
x	y
-1	
0	
1	
2	
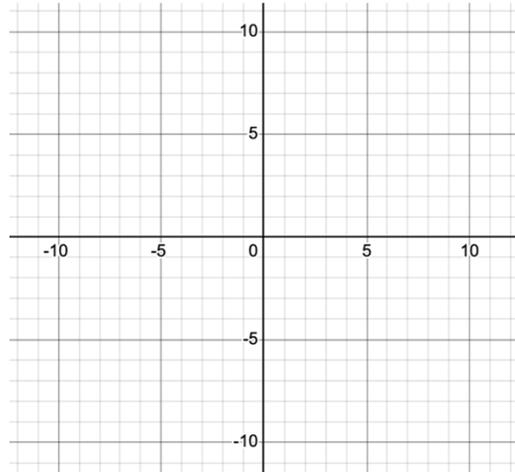
For Problem 8-13, use the given table and graph to solve the problem. Let the money earned be in dollars.

Cars Washed (x)	Money Earned (y)
1	5
2	10
3	15
4	20
5	25

Money Earned from Car Wash
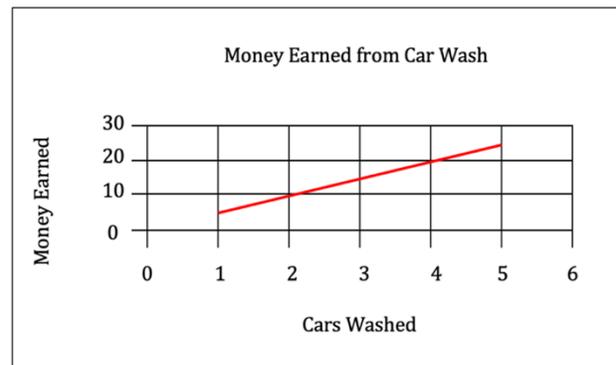
8.   How much money does Jamahl earn for each car he washes?

9.   How much would Jamahl earn if he washed 10 cars?

10.   Why is the graph increasing from left to right?

11.   What does the point $(0, 0)$ mean?

12.   What is the x-intercept? What is the y-intercept?

13.   Complete the equation for money earned (y) according to the number of cars washed (x).

$$y = \underline{\hspace{2cm}} x$$

<u>Section 2.6 The x-intercept</u>
<u>Practice Problems 2.6</u>
For Problem 1 and 2, find the x-intercept of the graph given.

1.

2.
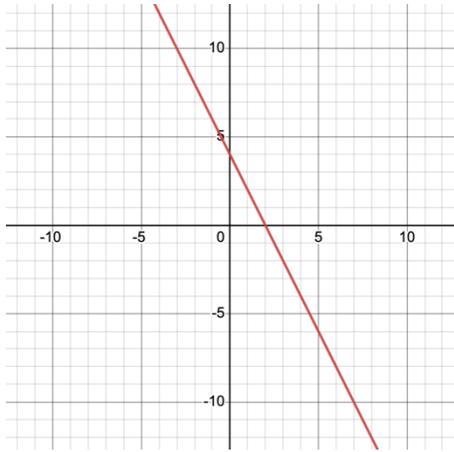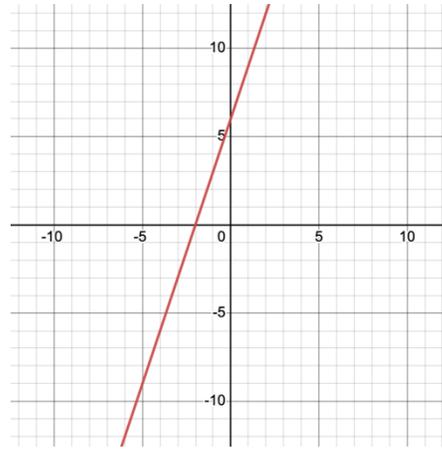
For Problem 3 and 4, complete the table given to find the x-intercept for each linear equation.

3.

x	y
2	-8
4	-6
6	-4
8	-2

4.

x	y
4	5
6	10
8	15

For Problem 5-8, substitute $y = 0$ for the equation given to find the x-intercept of the equation.

5. $y = 2x + 3$

6. $2x + 3y = 12$

7. $8 - 5x = y$

8. $-6x = 9y$

For Problem 9-12, solve the word problem given.

9.   What is the x-intercept for the equation $y = -3$? Explain your thinking.

10.   What is the x-intercept of the table given? Explain your thinking.

x	y
-1	-3
0	-3
1	-3

11.   What is the x-intercept for the graph given? Explain your thinking.
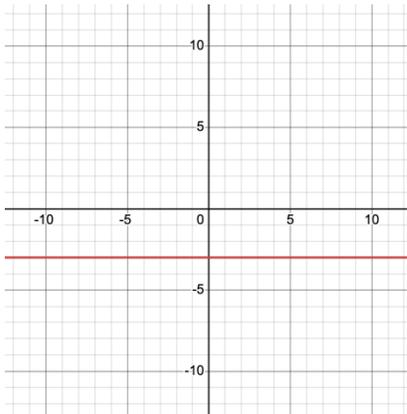
12.   Complete the table and graph given for the equation $x = 5$. What is the x-intercept?

x	y
	-2
	-1
	0
	1
	2
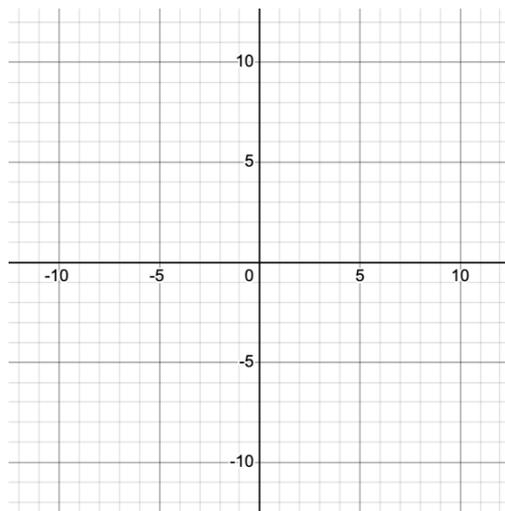
Section 2.7 The y-intercept
Practice Problems 2.7
For Problem 1 and 2, find the y-intercept of the graph given.

1.

2.
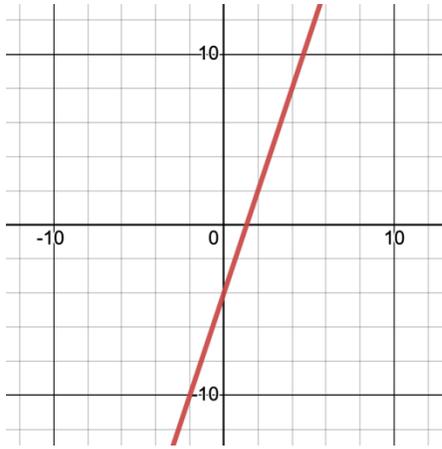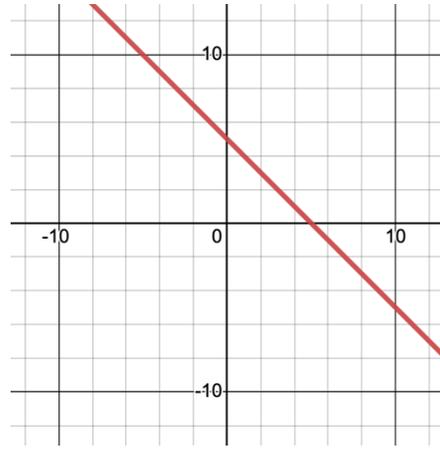
For Problem 3 and 4, complete the table given to find the y-intercept.

3.

x	y
24	12
20	14
16	16
12	18
8	20

4.

x	y
-3	8
-2	6
-1	4

For Problem 5-8, substitute $x = 0$ for the equation given to find the y-intercept.

5. $17x + 9 = 5y$

6. $27 - 12x = 9y$

7. $5x - 8y = 24$

8. $y = 3x - 11$

For Problem 9-12, solve the word problem given.

9.   What is the y-intercept for the equation $x = 6$? Explain you thinking.

10.   What is the y-intercept of the table below? Explain your thinking.

x	y
6	-1
6	0
6	1

11.   What is the y-intercept for the graph below? Explain your thinking.
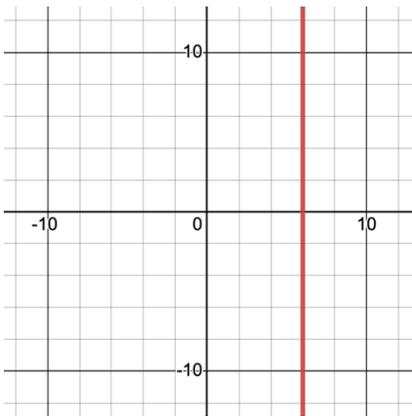
12.   Complete the table and graph given for $y = -4$. What is the y-intercept?

x	y
-2	
-1	
0	
1	
2	
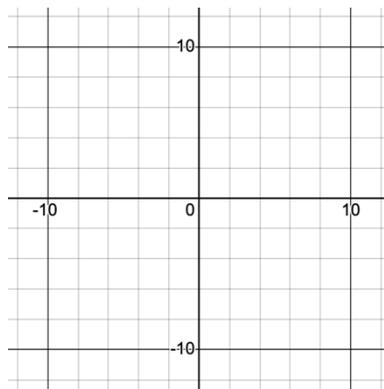
Section 2.8 The Slope of a Line
Practice Problems 2.8
For Problem 1-7, use the given diagram to solve the problem.
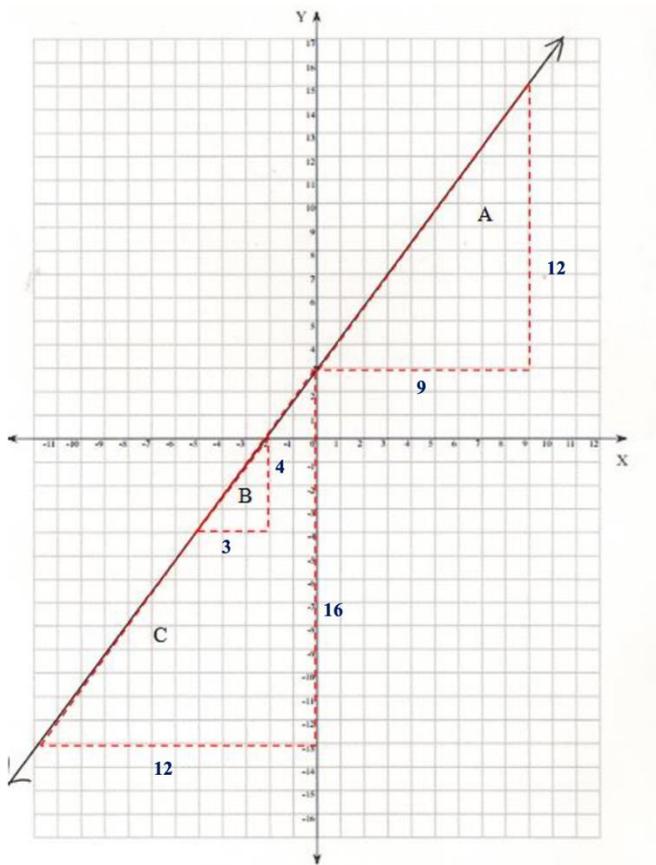
1.   Find the slope of slope triangle A.

2.   Find the slope of slope triangle B.

3.   Find the slope of slope triangle C.

4.   Simplify the ratios in Problem 1-3. What do you notice?

5.   What is the slope of the solid line in the diagram that includes all the triangles?

6.   Why is it easier to use points where x and y lines cross on the graph than to use points in between?

7.   Why is the slope of the line from Problem 6 positive instead of negative?

16

For Problem 8-12, use the given graph to solve the problem.
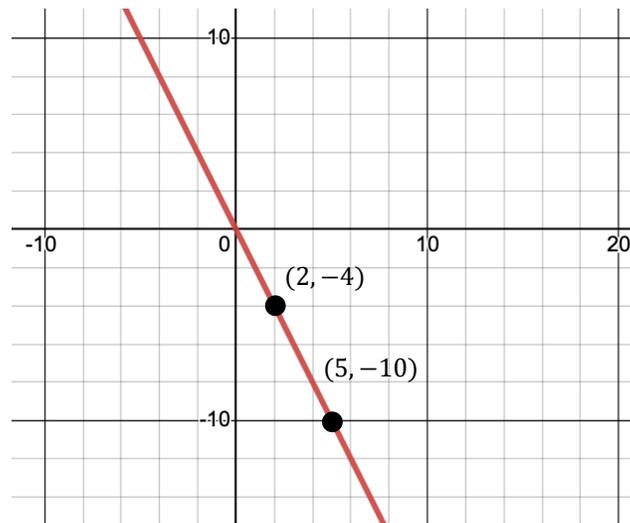
8.   Draw the slope triangle under the graph between points $(2, -4)$ and $(5, -10)$.

9.   What is the rise of the slope triangle (Δy − the vertical distance between the points − 4 and − 10)?

10.   What is the run of the slope triangle (Δx − the horizontal distance between the points 2 and 5)?

11.   Write the ratio for $\frac{\Delta y}{\Delta x}$. This would be $\frac{\text{rise}}{\text{run}}$. Simplify this to get the slope of the line.

12.   Find the slope triangle between the points $(0, 0)$ and $(2, -4)$. Is this the same as the rise over run from Problem 11?

Section 2.9 Finding Slope from a Graph
Practice Problems 2.9
For Problem 1-4, tell whether the slope is positive or negative and find the slope of the line given.

1.
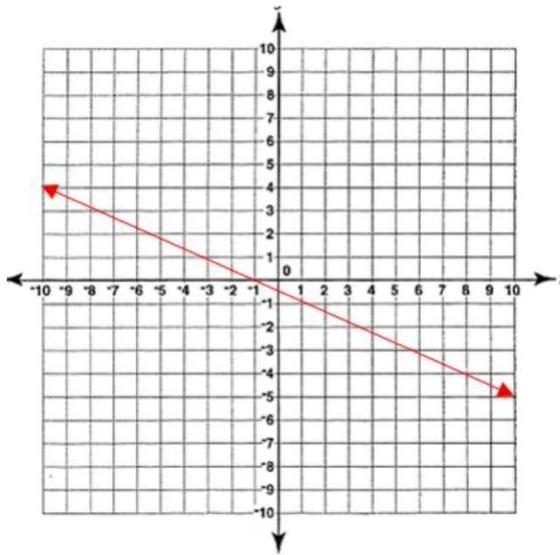
2.
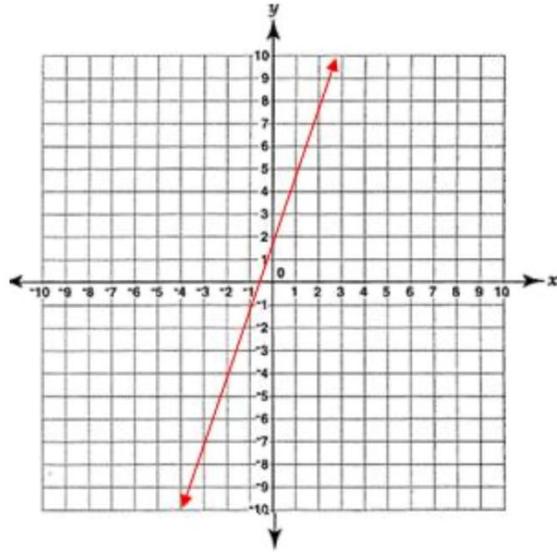
3.
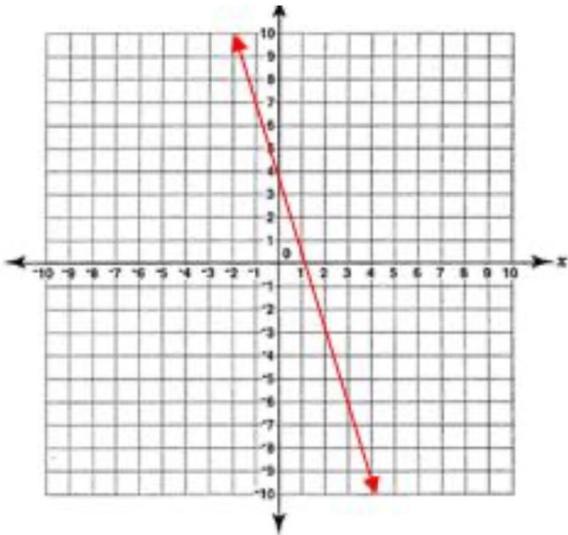
4.
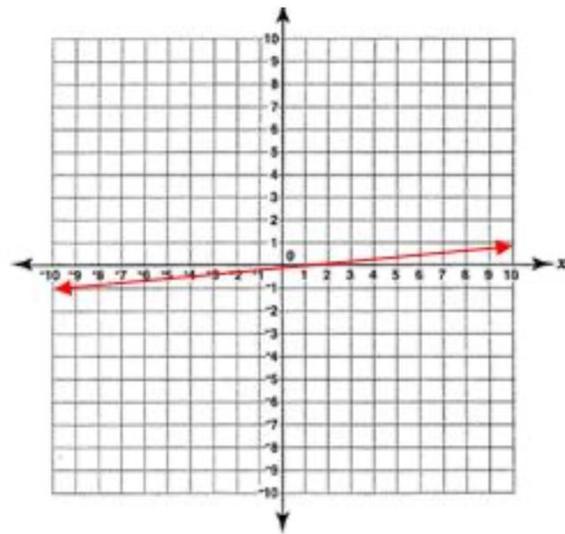
For Problem 5-8, fill in the blank to solve the problem.

5.   If the line is going down from left to right, the slope is _____.

6.   If the line is going _____ from left to right, the slope is positive.

7.   If the line is just flat (horizontal), with no incline up or down, the slope is _____.

8.   The slope of the _____ axis is zero.

For Problem 9-14, use the information below to solve the problem.

In one second, Christiansen takes a stride of 2.32 feet.

9.   Complete the table.

Number of Strides (x)	Total Distance of Strides (y)
1	2.32
2	4.64
3	
4	
5	

10.   What is the x-intercept of the table from Problem 9? What is the y-intercept of the table? Explain what these mean given the situation.

11.   Is there a constant change in the distance as the strides increase by 1?

12.   If this information is graphed as a line, will the slope be positive or negative?

13.   Draw a graph of the relationship between the number of strides and the total distance of Christiansen's stride. Connect the points from the table.
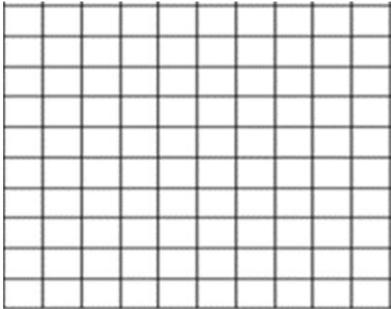
14.   What is the slope of the line? How do you find the slope from the table? How do you find it on the graph?

<u>Section 2.10 Finding Slope from Two Points</u>
<u>Practice Problems 2.10</u>
For Problem 1-5, find the slope of the line given two points that lie on the line.

1. $(8, 6)$ and $(3, 8)$ 2. $(-6, -3)$ and $(-3, 5)$

3. $(5, -3)$ and $(10, -5)$ 4. $(\frac{5}{2}, \frac{3}{4})$ and $(\frac{1}{2}, \frac{1}{4})$

5. $(0.3, 1.5)$ and $(0.8, 3.4)$

For Problem 6-9, use the given information to solve the problem.

Twila jogs with a stride length of 2.87 feet per stride.

6.   Complete the table and graph below.

Number of Strides	Total Distance of All Strides (ft.)
1	2.87
2	5.74
3	
4	
5	

Strides
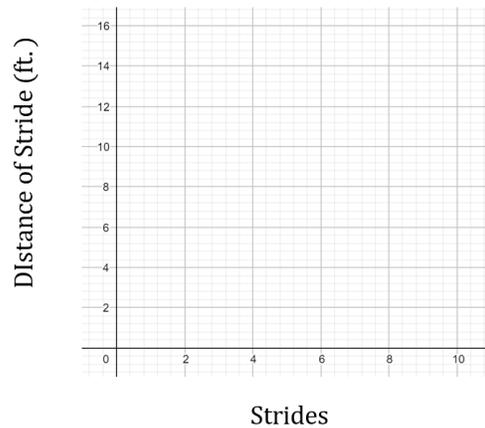
7.   Is the slope of the graph of the table positive or negative?
What does the steepness of the slope represent?

8.   Pick two points from the table and use the formula $\frac{y_2-y_1}{x_2-x_1}$ to find the slope.

9.   How do you know your slope from Problem 8 is the actual slope of the line using the table from Problem 6?

For Problem 10-13, use the given information to solve the problem.

Jerrie jogs with a stride length of 2.32 feet; Jaylen jogs with a stride length of 2.87 feet.

Jerrie: $\frac{2,320}{1,000} = 2.32$ feet per step

Jaylen: $\frac{2,870}{1,000} = 2.87$ feet per step

10.   Complete the table and graph the ordered pairs with connected lines. Use one color to represent Jerrie's strides and another to represent Jaylen's strides.

Number of Strides	Distance for Jerrie	Distance for Jaylen
1	2.32	2.87
2	4.64	5.74
3	6.96	8.61
4	9.28	11.48
5	11.6	14.35
6		
7		
8		
9		
10		

Comparing Strides

Distance of Strides
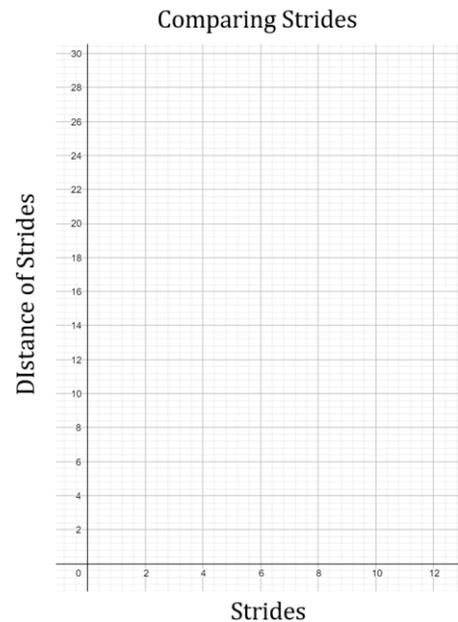
Strides

11.   Use two ordered pairs from the table in Problem 10 to find the slope of the line for Jerrie's total distance given the number of strides. Do not use the ordered pair $(1, 2.32)$. Does it match the slope in the table?

12.   Use two ordered pairs from the table in Problem 10 to find the slope of the line for Jaylen's total distance given the number of strides. Do not use the ordered pair $(1, 2.87)$. Does it match the slope in the table?

13.   How can you tell from the graph who has the longer jogging stride, Jaylen or Jerrie?

<u>Section 2.11 Slope-Intercept Form of an Equation</u>
<u>Practice Problems 2.11</u>
For Problem 1-5, identify the slope and y-intercept.

1. $y = 3x - 8$

2. $y = \frac{1}{2}x + 5$

3. $y = -7x + 1$

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

5. $y = -4x$

For Problem 6-10, change the equation given to slope-intercept form and identify the slope and y-intercept.

6. $3x = 2y$

7. $2x = 2y - 8$

8. $3x + y = 5$

9. $y = 2 - 3x$

10. $x - 4y = 10$

For Problem 11-12, use the given information to solve the problem.

Antonio makes $28 per hour at work. Mosley makes $28 per hour plus a $150 bonus check for each month he is employed. Lorenzo has not worked as long as Mosley, but longer than Antonio so he makes $28 dollars per hour plus a $50 bonus check for each month he is employed. At the end of the month, they each take a week of vacation.

11.   Match each equation with the correct employee's monthly wages given x is the hours worked per month and y is the total monthly earnings.

$y = 28x$:_____

$y = 28x + 50$: _____

$y = 28x + 150$: _____

12.   What represents the y-intercepts in each of the equations for Antonio, Mosley, and Lorenzo?

Section 2.12 Using Slope-Intercept Form to Graph Equations
Practice Problems 2.12
For Problem 1-7, draw the graph of the line for the equation given.

1. $y = 3x - 2$
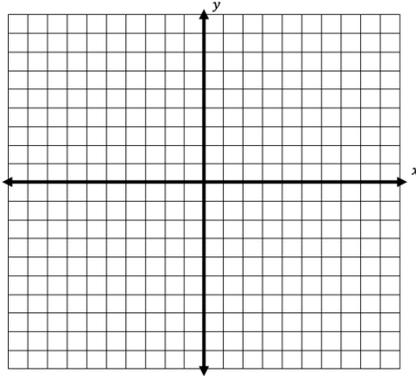
2. $y = \frac{2}{3}x + 4$
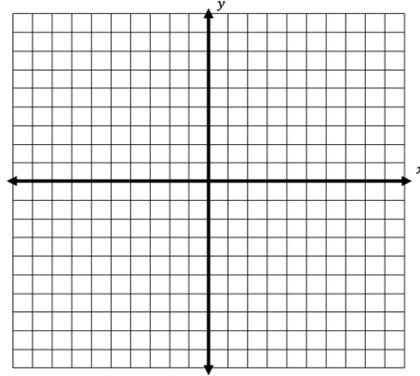
3. $y = -2x - 5$
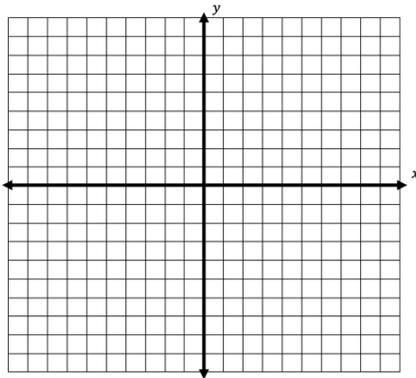
4. $y = -4x - 4$
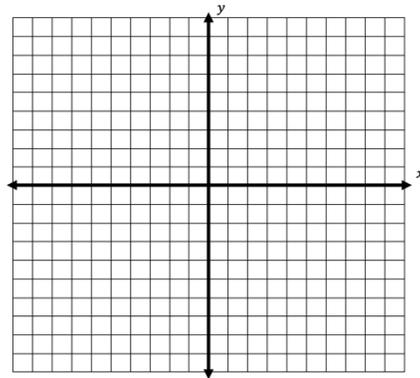
5. $y = -\frac{3}{4}x - 8$
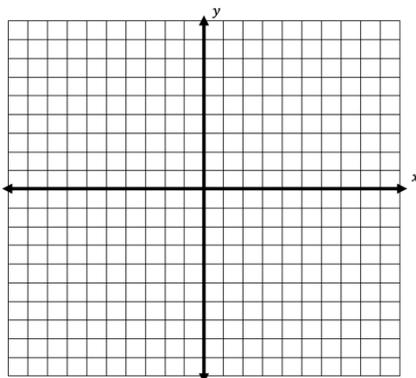
6. $y = -6x$
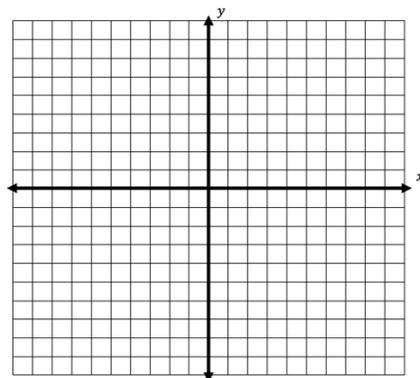
7. $y = -x - 3$
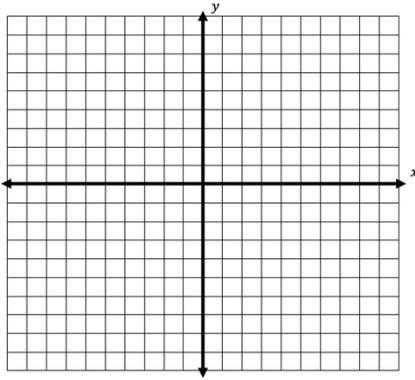
For Problem 8-10, use the information given to solve the problem.

8.   Alex was told that the x-intercept of a line is -4 and the y-intercept is -2. Draw the graph of the line for Alex.
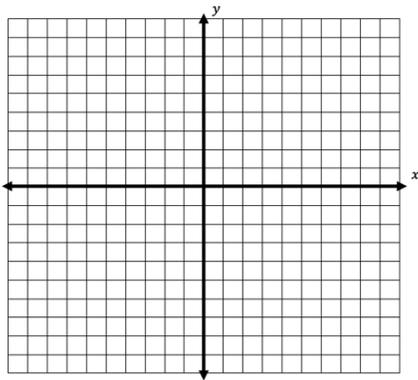
9. Matthew drew the line $x = 1$ and said the slope is 0 and the y-intercept is 1. Draw the line for Matthew and tell if his slope and y-intercept are correct or not.
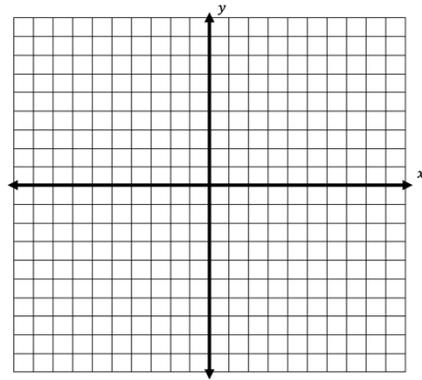
10.   Ryan drew the line $2 = -y$ and said there was no slope and the y-intercept was 2. Draw the line for Ryan and tell if his slope and y-intercept are correct or not.
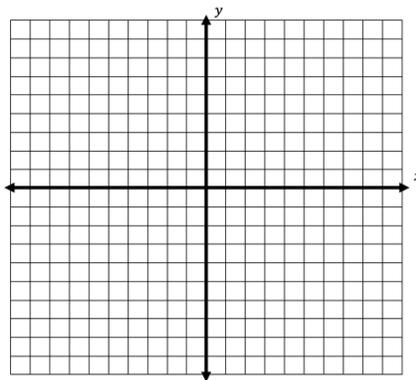
Section 2.13 Writing Equations from a Graph
Practice Problems 2.13

For Problem 1-5, write the slope-intercept equation of a line given the slope and y-intercept.

1. $m = 3$ and $b = 12$ 2. $m = -6$ and $b = -4$

3. $m = \frac{2}{3}$ and $b = 1$ 4. $m = 3$ and $b = -2$

5. $m = -\frac{3}{4}$ and $b = 3$

For Problem 6 and 7, find the slope-intercept equation of a line given a point on the line and the slope.
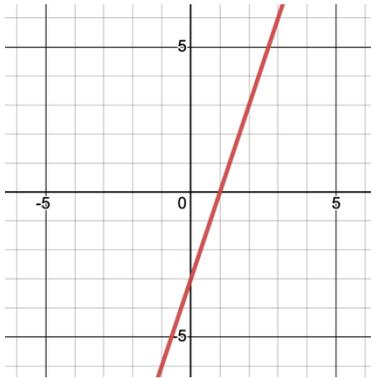
6.   Point: $(3, 6)$ Slope: 3 7.   Point: $(0, -3)$ Slope: -2
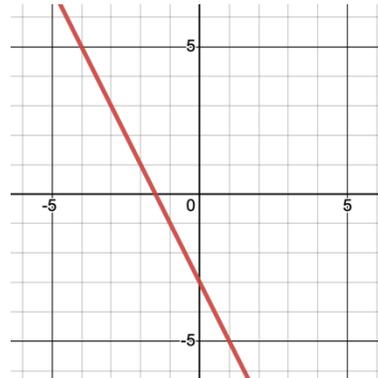
For Problem 8 and 9, find the slope-intercept equation of a line given two points.
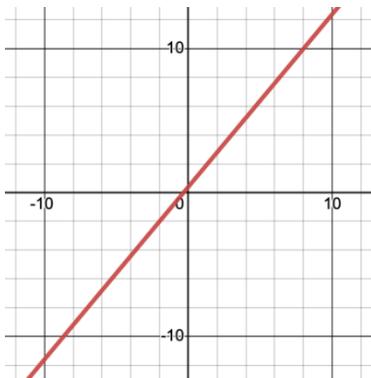
8.   Points: $(3, 4)$ and $(8, 10)$ 9.   Points: $(0, 0)$ and $(-3, -6)$
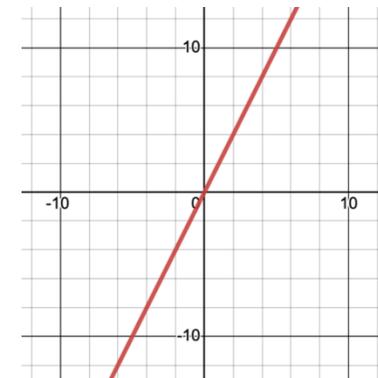
For Problem 10-12, use the information given to solve the problem.

10.   Write a slope-intercept equation for the line shown on the graph below.
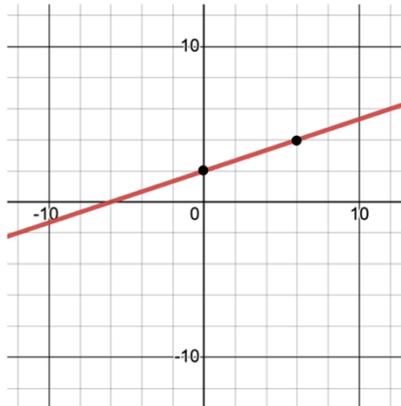
11.   It costs $75 to shampoo a carpet for the first room of a house and $20 for every room after that. Which is the slope and which is the y-intercept of the linear equation for this situation? What is the equation for the cost of shampooing carpets given the number of rooms shampooed?

12.   It costs $30 for a monthly cell phone fee and $0.20 per minute for any overseas phone calls. Which is the slope and which is the y-intercept of the linear equation for this situation? What is the equation for the monthly phone bill given the minutes for overseas calls?

Section 2.14 Module Review

For Problem 1-4, tell whether the graph given is linear or non-linear.

1. $y = -2x + 6$
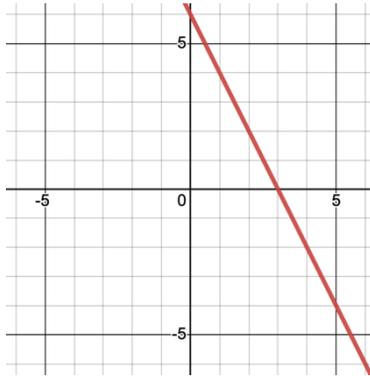
2. $y = x^2 + 3$
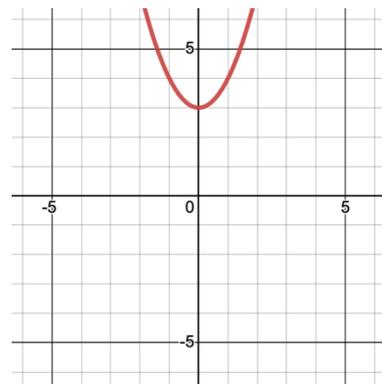
3. $y = \frac{1}{2}x - 1$
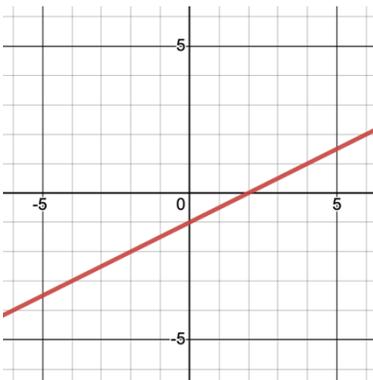
4. $y = 3x^3 - 1$
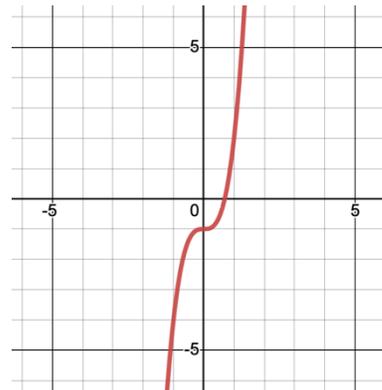
For Problem 5 and 6, use the given information to solve the problem.

5.   Complete the table for $y = 3x + 14$.

x	y
−3	
−2	
−1	
0	
1	
2	
3	

6.   Use the graph to the right to tell if the car is closer to the school or further away at the end of the time compared to the beginning of the time.
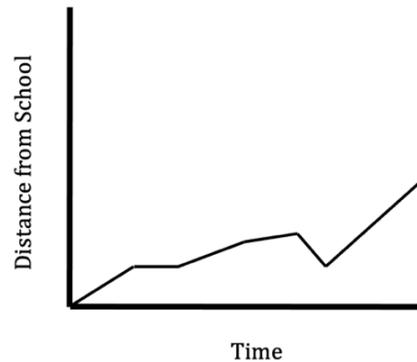
For Problem 7-10, find the x-intercept and the y-intercept for the equation given.

7. $y = 2x - 3$ 8. $y = 5x - 6$

9. $2x + 3y = 12$ 10. $4x - 2y = 9$

For Problem 11 and 12, find the slope of the line given two points on the line.

11. $(-3, 4)$ and $(6, 7)$ 12. $(9, 5)$ and $(5, 9)$

For Problem 13-16, find the slope and y-intercept given the slope-intercept form of the equation of the line.

13. $y = -\frac{2}{3}x + 2$ 14. $y = 5x - 8$

15. $y = -3x + 12$ 16. $y = \frac{3}{4}x - 3$

For Problem 17 and 18, write the slope-intercept form of the linear equation given the slope and y-intercept.

17. $m = 6$ and $b = -3$ 18. $m = -4$ and $b = 2$

For Problem 19 and 20, find the slope-intercept form of the equation of the line with the information given.

19. Point: $(3, 4)$ 20. Point: $(1, -3)$
     Slope: 5 Point: $(6, 2)$

Section 2.15 Module Test

For Problem 1-4, tell whether the graph given is linear or non-linear.

1.
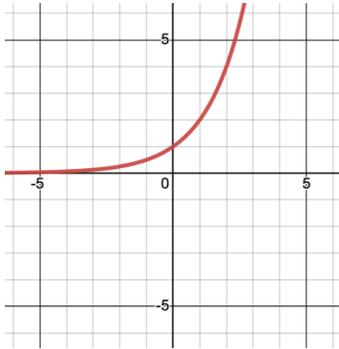
2.
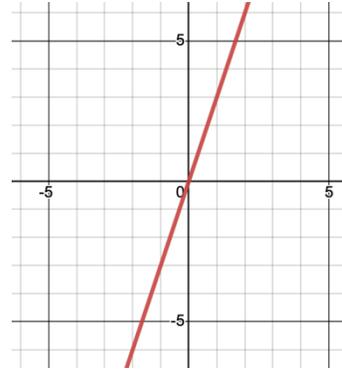
3.
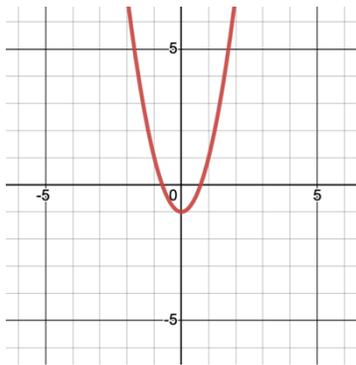
4.
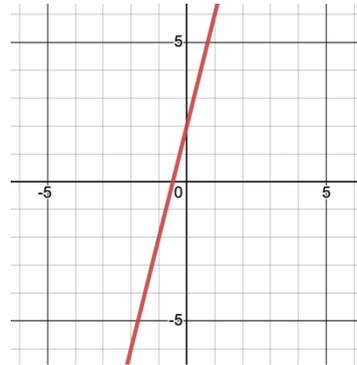
For Problem 5 and 6, use the information given to solve the problem.

5. Complete the table for $y = -3x + 2$.

6. Use the graph below to tell if the walker is further away from home or closer to home at the end of the time compared to the beginning if the x-axis represents time and the y-axis represents distance from home.

x	y
-3	
-2	
-1	
0	
1	
2	
3	
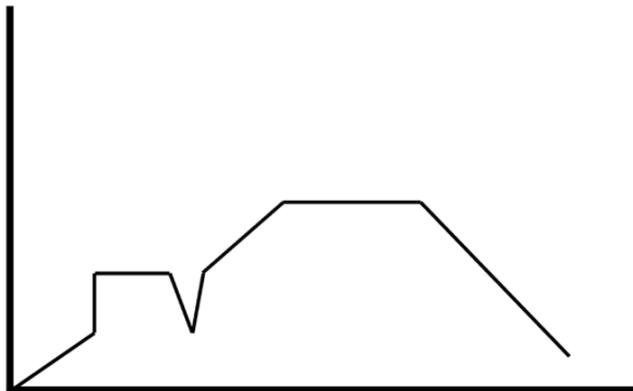
For Problem 7-10, find the x-intercept and the y-intercept for the equation given.

7. $y = \frac{1}{2}x - 2$

8. $y = -3x + 4$

9. $x + 2y = 4$

10. $-3x + y = -6$

For Problem 11 and 12, find the slope of the line given two points on the line.

11. $(4, -2)$ and $(8, 5)$

12. $(-3, -7)$ and $(-8, -4)$

For Problem 13-15, find the slope and y-intercept given the slope-intercept form of the equation of the line.

13. $y = -\frac{3}{4}x - 2$

14. $y = 5x + 6$

15. $y = -x - 3$

For Problem 16-18, write the slope-intercept form of the linear equation given the slope and y-intercept.

16. $m = \frac{6}{7}$ and $b = -8$

17. $m = \frac{4}{3}$

18. $m = 8$ and $b = 2$

For Problem 19 and 20, find the slope-intercept form of the equation of the line with the information given.

19.   Point: $(-2, -6)$
        Slope: -3

20.   Point: $(-8, -7)$
        Point: $(5, 6)$