About the Resources by Chapter

Family Letter (English and Spanish)

The Family Letters provide a way to quickly communicate to family members how they can help their student with the material of the chapter. They make the mathematics less intimidating and provide suggestions for helping students see mathematical concepts in common activities. A chart with the Learning Target and Success Criteria for each lesson is also provided.

Warm-Ups

Each section has two options for getting the class started. The Cumulative Practice questions review previously-learned concepts. The Prerequisite Skills Practice questions review prerequisite skills needed for the section.

Extra Practice

The Extra Practice exercises provide additional practice on the key concepts taught in the lesson.

Reteach

Each Reteach provides additional examples with more support for students who are struggling to understand the concepts. Exercises for these examples are also provided.

Enrichment and Extension

Each Enrichment and Extension extends the lesson and provides a challenging application of the key concepts.

Puzzle Time

Each Puzzle Time provides additional practice in a fun format in which students use their mathematical knowledge to solve a riddle. This format allows students to self-check their work.

Name____ Date___________

Chapter 1 Graphing Linear Functions

Dear Family,

Have you ever thought about how much you might weigh on another planet? Or why you would weigh a different amount on another planet?

What is gravity? How does gravity affect your weight on Earth? Is mass different from weight? If so, how is it different? Use the Internet to research these questions before considering how your weight would change if you visited another planet.

Here is an activity for you to complete as a family to determine how much you would weigh on different planets and on the moon. Upon completing the chart below, graph the information in a coordinate plane.

Given the equation $y = 0.17x$, where y represents an object's weight on the moon and x is an object's weight on Earth, determine how much each member of your family would weigh on the moon. Insert the weight of each member of your family in the chart below, from least to greatest.

x						
y						

- Is your weight on Earth more or less than your weight on the moon?

Now determine your family's weight on Mercury and Jupiter using the equations below. Complete a chart similar to the one above for each planet. Use a calculator if needed. Graph your weight on the moon, Earth, Mercury, and Jupiter in a coordinate plane, using a different color for each.

- The equation for the weight of an object on Mercury is $y = 0.38x$.
- The equation for the weight of an object on Jupiter is $y = 2.53x$.

Using your graph, which planet would you weigh the most on? the least? How can you tell?

How about your pet? How much would he or she weigh on the moon? Consider using the equations above to determine the weight of other items if they were on the other planets.

Enjoy exploring outer space together!

Name ______________________________ Date __________

Chapter 1 Graphing Linear Functions (continued)

	Learning Target	Success Criteria
Chapter 1 Graphing Linear Functions	Understand graphing linear functions.	• I can identify the graph of a linear function. • I can graph linear functions written in different forms. • I can describe the characteristics of a function. • I can explain how a transformation affects the graph of a linear function.
1.1 Interval Notation and Set Notation	Use interval notation and set-builder notation.	• I can represent intervals using interval notation. • I can represent intervals using set-builder notation.
1.2 Functions	Understand the concept of a function.	• I can determine whether a relation is a function. • I can find the domain and range of a function. • I can distinguish between independent and dependent variables.
1.3 Characteristics of Functions	Describe characteristics of functions.	• I can estimate intercepts of a graph of a function. • I can approximate when a function is positive, negative, increasing, or decreasing. • I can sketch a graph of a function from a verbal description.
1.4 Linear Functions	Identify and graph linear functions.	• I can identify linear functions using graphs, tables, and equations. • I can graph linear functions with discrete and continuous domains. • I can write real-life problems that correspond to discrete or continuous data.
1.5 Function Notation	Understand and use function notation.	• I can evaluate functions using function notation. • I can interpret statements that use function notation. • I can graph functions represented using function notation.
1.6 Graphing Linear Equations in Standard Form	Graph and interpret linear equations written in standard form.	• I can graph equations of horizontal and vertical lines. • I can graph linear equations written in standard form using intercepts. • I can solve real-life problems using linear equations in standard form.
1.7 Graphing Linear Equations in Slope-Intercept Form	Find the slope of a line and use slope-intercept form.	• I can find the slope of a line. • I can use the slope-intercept form of a linear equation. • I can solve real-life problems using slopes and y-intercepts.
1.8 Transformations of Linear Functions	Graph transformations of linear functions.	• I can identify a transformation of a linear graph. • I can graph transformations of linear functions. • I can explain how translations, reflections, stretches, and shrinks affect graphs of functions.

Nombre ____ Fecha_________

Capítulo 1 Realizar gráficas de funciones lineales

Estimada familia:

¿Alguna vez han pensado cuánto pesarían aproximadamente en otro planeta? ¿O por qué tendrían otro peso en otro planeta?

¿Qué es la gravedad? ¿De qué manera la gravedad afecta sus pesos en la Tierra? ¿La masa es diferente al peso? Si lo es, ¿en qué se diferencia? Consulten en Internet para investigar sobre estas preguntas antes de considerar cómo cambiarían sus pesos si visitaran otro planeta.

A continuación, encontrarán una actividad para que completen en familia para determinar cuánto pesarían en distintos planetas y en la Luna. Después de completar la siguiente tabla, hagan una gráfica de la información en un plano de coordenadas.

Dada la ecuación $y = 0.17x$, donde y representa el peso de un objeto en la Luna y x es el peso de un objeto en la Tierra, determinen cuánto pesaría cada integrante de la familia en la Luna. Ingresen el peso de cada integrante de su familia en la siguiente tabla, de menor a mayor.

x						
y						

- ¿Su peso en la Tierra es mayor o menor que su peso en la Luna?

Ahora determinen el peso de su familia en Mercurio y Júpiter usando las siguientes ecuaciones. Completen una tabla similar a la tabla de arriba para cada planeta. Usen una calculadora si la necesitan. Hagan una gráfica de su peso en la Luna, la Tierra, Mercurio y Júpiter en un plano de coordenadas, con un color diferente para cada uno.

- La ecuación para el peso de un objecto en Mercurio es $y = 0.38x$.
- La ecuación para para el peso de un objecto en Júpiter es $y = 2.53x$.

Basándose en la gráfica, ¿en qué planeta pesarían más? ¿Menos? ¿Cómo lo saben?

¿Y su mascota? ¿Cuánto pesaría en la Luna? Consideren usar las ecuaciones mencionadas para determinar el peso de otros objetos si estuviesen en otros planetas.

¡Disfruten explorando el espacio exterior juntos!

Nombre ____ Fecha ________

Capítulo 1 Realizar gráficas de funciones lineales (continuación)

	Objetivo de aprendizaje	Criterios de éxito
Capítulo 1 Realizar gráficas de funciones lineales	Comprender cómo realizar gráficas de funciones lineales.	• Puedo identificar la gráfica de una función lineal. • Puedo realizar gráficas de funciones lineales escritas en diferentes formas. • Puedo describir las características de una función. • Puedo explicar cómo una transformación afecta a la gráfica de una función lineal.
1.1 Notación de intervalos y notación de conjuntos	Utilizar notación de intervalos y del constructor de conjuntos.	• Se representar intervalos con el uso de notación de intervalos. • Se representar intervalos con el uso de notación del constructor de conjuntos.
1.2 Funciones	Comprender el concepto de una función.	• Puedo determinar si una relación es una función. • Puedo encontrar el dominio y el rango de una función. • Puedo distinguir entre variables dependientes e independientes.
1.3 Características de las funciones	Describir las características de las funciones.	• Puedo estimar intersecciones de la gráfica de una función. • Puedo aproximar cuando una función es positiva, negativa, aumenta o disminuye. • Puedo dibujar una gráfica de una función a partir de una descripción verbal.
1.4 Funciones lineales	Identificar realizar gráficas de funciones lineales.	• Puedo identificar funciones lineales a través de gráficas, tablas y ecuaciones. • Puedo realizar gráficas de funciones lineales con dominios discretos y continuos. • Puedo escribir problemas de la vida real que corresponden a datos discretos o continuos.
1.5 Notación de función	Comprender y usar la notación de función.	• Puedo evaluar funciones mediante la notación de función. • Puedo interpretar enunciados que usen notación de función. • Puedo realizar gráficas de funciones representadas con la notación de función.
1.6 Realizar gráficas de ecuaciones lineales en forma estándar	Realizar gráficas e interpretar ecuaciones lineales escritas en forma estándar.	• Puedo realizar gráficas de ecuaciones de líneas horizontales y verticales. • Puedo realizar gráficas de ecuaciones lineales escritas en forma estándar con el uso de intersecciones. • Puedo resolver problemas de la vida real con ecuaciones lineales en forma estándar.
1.7 Realizar gráficas de ecuaciones lineales en forma de pendiente e intersección	Encontrar la pendiente de una línea y usar la forma de pendiente e intersección.	• Puedo encontrar la pendiente de una línea. • Puedo usar la forma de pendiente e intersección de una ecuación lineal. • Puedo resolver problemas de la vida real con pendientes e intersecciones de y.
1.8 Transformaciones de funciones lineales	Transformaciones gráficas de funciones lineales.	• Puedo identificar una transformación de una gráfica lineal. • Puedo realizar transformaciones gráficas de funciones lineales. • Puedo explicar de qué manera las traslaciones, reflexiones, extensiones y encogimientos afectan las gráficas de las funciones.

Name____ Date__________

1.1 Cumulative Practice

For use before Lesson 1.1

Solve the inequality.

1. $6x - 13 < 3x + 5$

2. $8x - 15 \leq 5x + 12$

1.1 Prerequisite Skills Practice

For use before Lesson 1.1

Graph the inequality.

1. $x < 5$

2. $t \geq 0$

Name ______________________________ Date __________

1.1 Extra Practice

In Exercises 1 and 2, use braces to list the elements in the set.

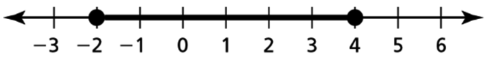
1. the set of whole numbers less than 17

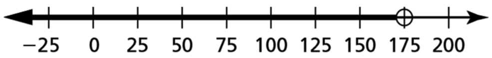
2. the set of even integers greater than -10

In Exercises 3–7, write the interval in interval notation.

3. $-6 < x \leq 10$

4. $x < 14$

5. 

6. 

7. the real numbers between -3 and 43

In Exercises 8 and 9, sketch the graph of the set of numbers.

8. $\{x \mid -4 \leq x < 12\}$

9. $\{x \mid x \neq 0\}$

In Exercises 10–15, write the set of numbers in set-builder notation.

10. $[-3, 3]$

11. $(-\infty, -4)$ or $[0, \infty)$

12. $(-\infty, 30]$ or $[45, \infty)$

13. the set of all real numbers except -12

14. the set of all real numbers less than -3

15. the set of all integers greater than 10 and less than 80

16. The slot size limit for Fish A is from 28 to 32 inches. The minimum size limit for Fish B is 11 inches. Write the ranges of the Fish A and Fish B in interval notation and in set-builder notation. Does the range for the Fish B seem reasonable? Explain.

17. You are writing a term paper.

    a. Not including the title page and bibliography page, the paper must contain at least 1500 words but not more than 2000 words. Find the interval for the number x of words for the paper using interval notation.

    b. The paper must contain a minimum of 5 bibliographies. Find the interval for the number x of bibliographies using set-builder notation.

Name______________________________ Date__________

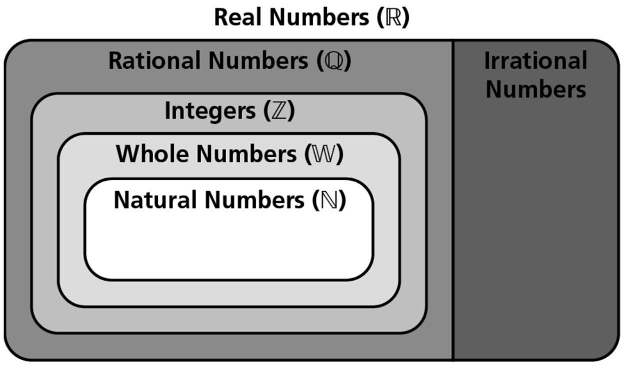
1.1 Reteach

A collection of objects is called a **set**. You can use braces { } to represent a set by listing its members or *elements*. For instance, the set

$\{1, 2, 3\}$ A set with three members

contains the three numbers 1, 2, and 3. Many sets are also described in words, such as the set of real numbers.

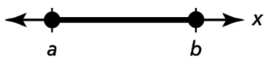
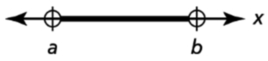
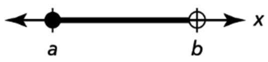
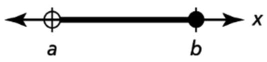
If all the members of a set A are also members of a set B, then set A is a **subset** of set B. The set of natural numbers $\{1, 2, 3, 4, \ldots\}$ is a subset of the set of real numbers. The diagram shows several important subsets of the real numbers.



Key Idea

Bounded Intervals on the Real Number Line

Let a and b be two real numbers such that $a < b$. Then a and b are the **endpoints** of four different **bounded intervals** on the real number line, as show below. A bracket or closed circle indicates that the endpoint is included in the interval and a parenthesis or open circle indicates that the endpoint is not included in the interval.

Inequality	*Interval Notation*	*Graph*
$a \le x \le b$	$[a, b]$	
$a < x < b$	(a, b)	
$a \le x < b$	$[a, b)$	
$a < x \le b$	$(a, b]$	

The length of any bounded interval, $[a, b]$, (a, b), $[a, b)$, or $(a, b]$, is the distance between its endpoints: $b - a$. Any bounded interval has a *finite* length. An interval that does not have a finite length is called *unbounded* or *infinite*.

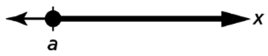
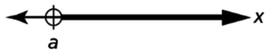
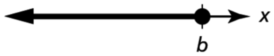
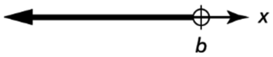
Name ____ Date __________

1.1 Reteach (continued)

Key Idea

Unbounded Intervals on the Real Number Line

Let a and b be real numbers. Each interval on the real number line show below is called an **unbounded interval**.

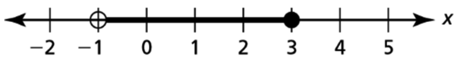
Inequality	*Interval Notation*	*Graph*
$x \geq a$	$[a, \infty)$	
$x > a$	(a, ∞)	
$x \leq b$	$(-\infty, b]$	
$x < b$	$(-\infty, b)$	
	$(-\infty, \infty)$	

The symbols ∞ (*infinity*) and $-\infty$ (*negative infinity*) are used to represent the unboundedness of intervals such as $[7, \infty)$ and $(-\infty, 7]$. Because these symbols do not represent real numbers, they are always enclosed by parenthesis.

EXAMPLE Writing Interval Notation

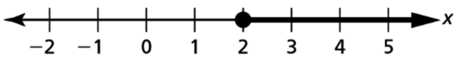
Write each interval in interval notation.

a. $x \geq 2$

b. 

SOLUTION

a. Graph the interval.



The graph represents all the real numbers greater than or equal to 2. This is the unbounded interval $[2, \infty)$.

b. The graph represents all the real numbers between -1 and 3, including the endpoint 3. This is the bounded interval $(-1, 3]$.

Name______________________________ Date__________

1.1 Reteach (continued)

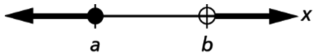
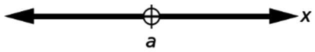
Key Idea

Set-Builder Notation

Set-builder notation uses symbols to define a set in terms of the properties of the members of the set.

Set-builder notation $\{x \mid x < b\}$

Words the set of all real numbers x such that x is less than b

Set-builder Notation	*Graph*
$\{x \mid x \leq a \text{ or } x > b\}$	
$\{x \mid x \neq a\}$	

EXAMPLE Using Set-Builder Notation

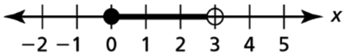
Sketch the graph of each set of numbers.

a. $\{x \mid 0 \leq x < 3\}$

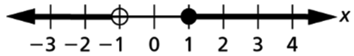
b. $\{x \mid x < -1 \text{ or } x \geq 1\}$

SOLUTION

a. The real numbers in the set satisfy both $x \geq 0$ *and* $x < 3$.



b. The real numbers in the set satisfy either $x < -1$ *or* $x \geq 1$.



EXAMPLE Writing Set-Builder Notation

Write the set of numbers in set-builder notation.

a. the set of all whole numbers less than 43

b. $(-\infty, 6)$ or $(6, \infty)$

SOLUTION

a. x is less than 43 and x is a whole number.

This symbol denotes membership in a set.

▶ $\{x \mid x < 43 \text{ and } x \in \mathbb{W}\}$

b. x can be any real number except 6.

▶ $\{x \mid x \neq 6\}$

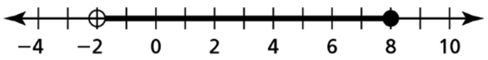
Name ____ Date __________

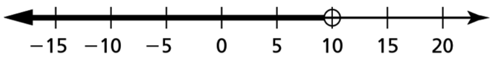
1.1 Reteach (continued)

In Exercises 1–5, write the interval in interval notation.

1. $-1 < x < 8$

2. $x \geq 20$

3. 

4. 

5. the real numbers from 0 to 25

In Exercises 6–9, sketch the graph of the set of numbers.

6. $\{x \mid 5 < x \leq 9\}$

7. $\{x \mid -3 \leq x < 4\}$

8. $\{x \mid x \leq -2 \text{ or } x > 8\}$

9. $\{x \mid x \leq -6 \text{ or } x \geq -1\}$

In Exercises 10–15, write the set of numbers in set-builder notation.

10. $(44, 77]$

11. $[-7, 20)$

12. $(-\infty, 1]$ or $[5, \infty)$

13. $(-\infty, 2)$ or $[8, \infty)$

14. the set of all integers greater than 5 and less than 15

15. the set of all real numbers except 100

Name________________________________ Date__________

1.1 Enrichment and Extension

Inequalities and Set Notation

In Exercises 1–4, write the verbal statement using set-builder notation.

1. the set of all real numbers x and y such that x is greater than 1 less than y

2. the set of all real numbers a and b such that a is at least 5 more than b

3. the set of all real numbers x and y such that x is at most twice y

4. the set of all real numbers x, y, and z such that z is no less than half the sum of x and y

In Exercises 5–10, solve the inequality, if possible. Write the solution using both interval notation and set-builder notation.

5. $2 + 3x > x + 4$

6. $ax - 1 < (a - 1)x - a$

7. $ax < a + 1 - x, a > 0$

8. $(3a + 2)x + 5 \geq 2ax - 3, a < -2$

9. $(5a + 1)x + (4a - 3)x \leq ax + 2(4a - 1)x$

10. $(1 + a)x - (1 - a)x > 2ax$

In Exercises 11–16, solve the compound inequality, if possible. Write the solution using both interval notation and set-builder notation.

11. $5x + 6 \leq 0$ *and* $-2x + 5 < 25$

12. $5x + 6 \geq 0$ *or* $-2x + 5 > 25$

13. $12x - 3 \geq 9$ *or* $1 - 8x < -2$

14. $2x - 11 \geq -5$ *and* $-4x + 13 \geq 1$

15. $3x - 11 < -23$ *and* $2x + 7 > 10$

16. $5x > 0$ *or* $2x - 1 < 1$

Name ______________________________ Date __________

1.1 Puzzle Time

What Fish Only Swims At Night?

Write the letter of each answer in the box containing the exercise number.

Write the interval in interval notation.

1. $-2 < x < 10$

2. $x \leq 46$

3. the real numbers from -2 through 10

4. the real numbers greater than or equal to 46

Write the set of numbers in set-builder notation.

5. $[-12, -3]$

6. $(-\infty, -8]$ or $[8, \infty)$

7. the set of all integers less than 12

8. the set of all real numbers except 8

9. the set of all real numbers greater than 15 and less than or equal to 55

Answers

I. $\{x \mid x \in \mathbb{Z} \text{ and } x < 12\}$

S. $(-\infty, 46]$

H. $\{x \mid 15 < x \leq 55\}$

A. $(-2, 10)$

A. $[46, \infty)$

R. $\{x \mid -12 \leq x \leq -3\}$

F. $\{x \mid x \leq -8 \text{ or } x \geq 8\}$

T. $[-2, 10]$

S. $\{x \mid x \neq 8\}$

P. $\{x \mid x < 12\}$

R. $\{x \mid 15 \leq x \leq 55\}$

T. $\{x \mid x < -8 \text{ or } x > 8\}$

1		2	3	4	5	6	7	8	9

Name____ Date__________

1.2 Cumulative Practice
For use before Lesson 1.2

Solve the equation for *y*.

1. $8y + 7x = 5$

2. $2y - 5x = 8$

1.2 Prerequisite Skills Practice
For use before Lesson 1.2

Use one coordinate plane to plot the points.

1. $A(2, -4)$

2. $B(-2, 2)$

Name ______________________________ Date __________

1.2 Extra Practice

In Exercises 1–4, determine whether the relation is a function. Explain.

1. $(-4, 2), (2, -4), (6, 6), (12, 18), (18, 12)$

2. $(9, 4), (8, 2), (7, 0), (6, -2), (7, -4)$

3.

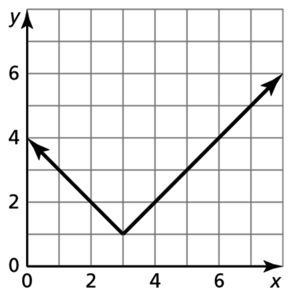
Input, *x*	0	1	3	2	1
Output, *y*	1	5	10	15	20

4.

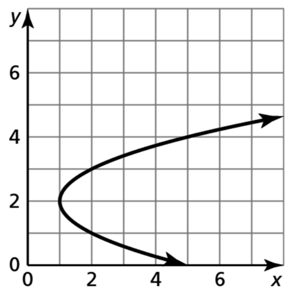
Input, *x*	0	1	2	3	4
Output, *y*	-14	-7	0	7	14

In Exercises 5 and 6, determine whether the graph represents a function. Explain.

5.

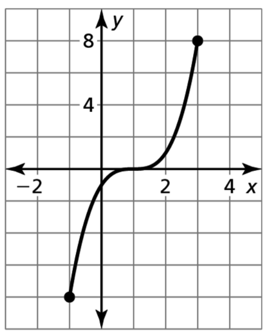


6.

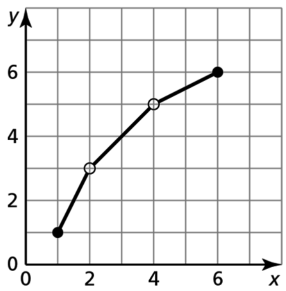


In Exercises 7 and 8, find the domain and range of the function represented by the graph.

7.

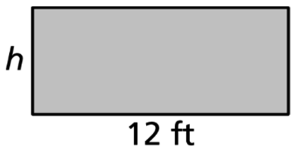


8.



9. The equation $2x + 1.5y = 18$ represents the number x of book raffle tickets and the number y of food raffle tickets you buy at a club event. Represent the situation in a table and in a coordinate plane. Does the situation represent a function? Explain.

10. The area of the rectangle shown is less than 240 square feet. Find the domain and range of a function that represents the area of the rectangle.



Name____ Date__________

1.2 Reteach

A **relation** pairs inputs with outputs. When a relation is given as ordered pairs, the x-coordinates are inputs and the y-coordinates are outputs. A relation that pairs each input with *exactly one* output is a **function**.

EXAMPLE Determining Whether Relations are Functions

Determine whether each relation is a function. Explain.

a. $(-4, 4), (-3, 3), (-2, 2), (-1, 3), (0, 4)$

b.

Input, x	2	4	6	8	6
Output, y	4	3	2	3	4

SOLUTION

a. Every input has exactly one output.

▶ So, the relation is a function.

b. The input 6 has two outputs, 2 and 4.

▶ So, the relation is *not* a function.

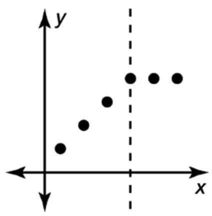
Key Idea

Vertical Line Test

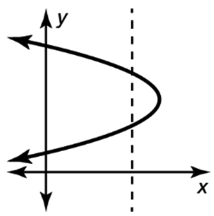
Words A graph represents a function when no vertical line passes through more than one point on the graph.

Examples

Function



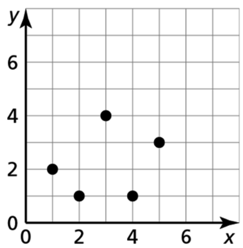
Not a function



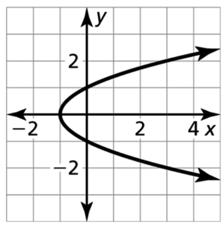
EXAMPLE Using the Vertical Line Test

Determine whether each graph represents a function. Explain.

a.



b.



SOLUTION

a. No vertical line can be drawn through more than one point on the graph.

▶ So, the graph represents a function.

b. Vertical lines can be drawn through more than one point on the graph.

▶ So, the graph does *not* represent a function.

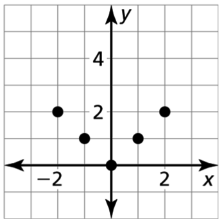
Name ____ Date __________

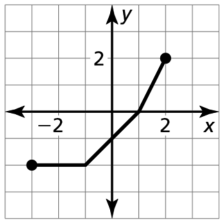
1.2 Reteach (continued)

The **domain** of a function is the set of all possible input values.
The **range** of a function is the set of all possible output values.

EXAMPLE Finding the Domain and Range from a Graph

Find the domain and range of the function represented by the graph.

a. 

b. 

SOLUTION

a. Write the ordered pairs: $(-2, 2), (-1, 1), (0, 0), (1, 1), (2, 2)$. Identify the inputs and outputs. The inputs are $-2, -1, 0, 1$, and 2. The outputs are 2, 1, 0, 1, and 2.

▶ The domain is $-2, -1, 0, 1$, and 2. The range is 0, 1, and 2.

b. Identify the *x*- and *y*-values represented by the graph.

▶ The domain is $-3 \le x \le 2$. The range is $-2 \le y \le 2$.

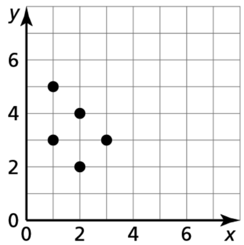
In Exercises 1 and 2, determine whether the relation is a function. Explain.

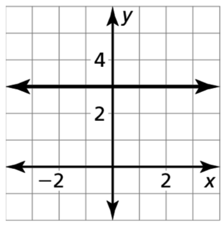
1. $(8, -4), (4, -2), (2, 0), (4, 2), (8, 4)$

2.

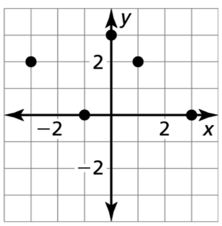
Input, *x*	0	2	4	6	8
Output, *y*	3	7	11	15	19

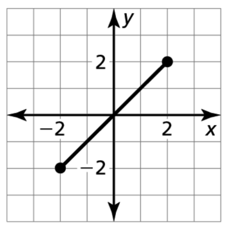
In Exercises 3 and 4, determine whether the graph represents a function. Explain.

3. 

4. 

In Exercises 5 and 6, find the domain and range of the function represented by the graph.

5. 

6. 

Name______________________________ Date__________

1.2 Enrichment and Extension

A Quadratic Function: The Diving Problem

You are jumping off the 10-foot diving board at the local pool. You bounce up at 6 feet per second and then drop toward the water. Your height h above the water, in terms of time t, follows the function shown.

$$h(t) = -16t^2 + 6t + 10$$

a. Graph this function, with t on the horizontal axis. Fill in a table of values where the increments of time are tenths of a second.

b. Explain what the domain and range might be and why.

c. Explain why this situation is quadratic instead of linear. Give a graphical explanation and a logical explanation.

d. Use the graph to determine the maximum height of your dive.

e. Use the graph to determine when you reach the maximum height of your dive.

f. Use the graph to determine how long it takes you to hit the water.

g. For a quadratic equation of the form $ax^2 + bx + c = 0$, the solutions of the quadratic equation are given by the *Quadratic Formula:*

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

Use the Quadratic Formula to prove your answer in part (f).

Name ____ Date __________

1.2 Puzzle Time

What Has A Foot On Each End And One In The Middle?

Write the letter of each answer in the box containing the exercise number.

Determine whether the relation is a function.

1. $(8, 5), (6, -2), (4, -9), (2, -6), (4, 7)$

H. function **I.** not a function

2. $(2, -3), (3, 2), (4, 7), (5, 14), (6, 23)$

A. function **B.** not a function

3. $(-11, 2), (-9, 2), (-7, 3), (-5, 3), (-3, 3)$

A. function **B.** not a function

4. $(1, -4), (2, 1), (3, 4), (3, 3), (4, 2)$

B. function **C.** not a function

5. $(17, -3), (2, -2), (1, 1), (2, 2), (17, 3)$

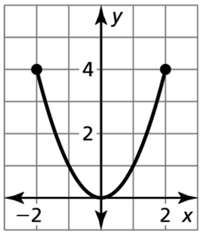
C. function **D.** not a function

6. $(-4, 12), (1, 6), (4, -2), (7, -8), (10, -14)$

K. function **L.** not a function

Find the domain and range of the function represented by the graph.

7.



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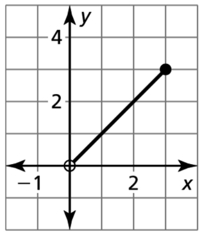


S. $D: 0 \leq x \leq 4$
$R: -2 \leq y \leq 2$

Q. $D: 0 \leq x \leq 3$
$R: 0 \leq y \leq 3$

T. $D: \{x \mid -2 \leq x \leq 2\}$
$R: \{y \mid 0 \leq y \leq 4\}$

R. $D: (0, 3]$
$R: (0, 3]$

The function $t = -8j + 24$ represents the number of *t* tomatoes that your neighbor has left after making *j* jars of homemade salsa.

9. Identify the dependent variable.

R. jars of salsa **S.** tomatoes

10. Identify the independent variable.

Y. jars of salsa **Z.** tomatoes

3		10	2	8	5	9	7	1	4	6

Name______________________________ Date__________

1.3 Cumulative Practice
For use before Lesson 1.3

Solve the equation.

1. $\frac{t}{2} = 9$

2. $-\frac{x}{7} = 4$

1.3 Prerequisite Skills Practice
For use before Lesson 1.3

Solve the inequality. Graph the solution.

1. $r - 5 > 4$

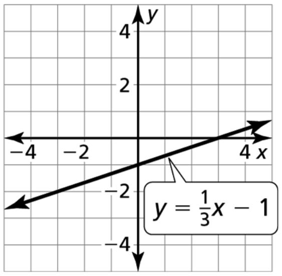
2. $h + 3 \leq 9$

Name ______________________________ Date __________

1.3 Extra Practice

In Exercises 1–4, estimate the intercepts of the graph of the function.

1.



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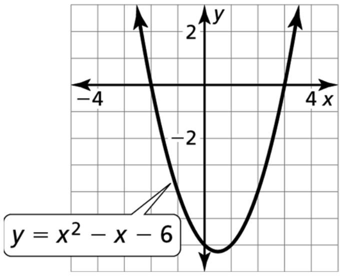

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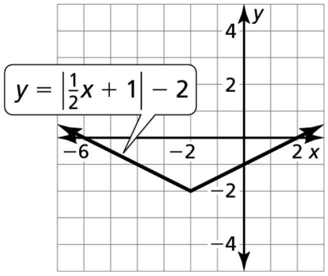

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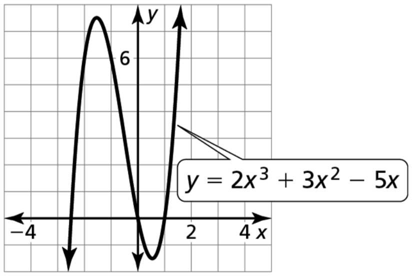
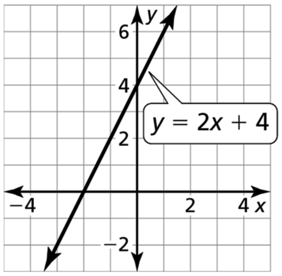
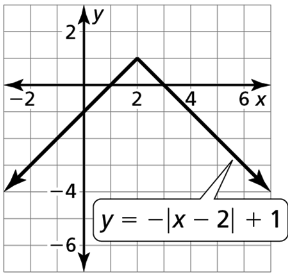


In Exercises 5–8, approximate when the function is positive, negative, increasing, or decreasing. Then describe the end behavior of the function.

5.



6.



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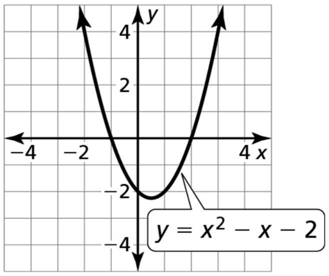

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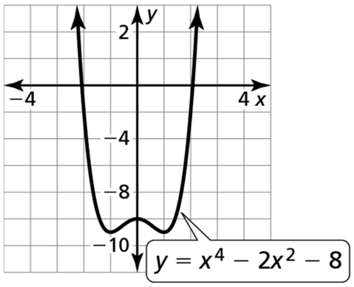


9. Sketch a graph of a function with the given characteristics.

- The function is increasing when $x > 4$ and decreasing when $x < 4$.
- The function is positive when $x < -2$, negative when $-2 < x < 10$, and positive when $x > 10$.

Name____ Date__________

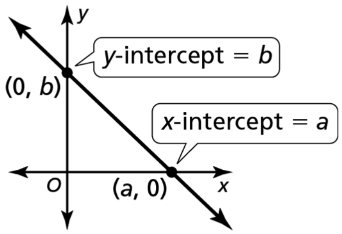
1.3 Reteach

Key Idea

Intercepts

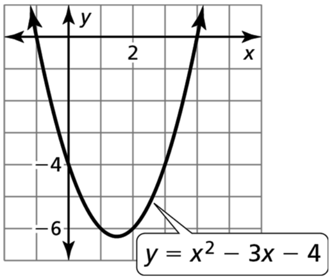
An ***x*-intercept** of a graph is the x-coordinate of a point where the graph intersects the x-axis. It occurs when $y = 0$.

A ***y*-intercept** of a graph is the y-coordinate of a point where the graph intersects the y-axis. It occurs when $x = 0$.



EXAMPLE Estimating Intercepts

Estimate the intercepts of the graph of the function.



SOLUTION

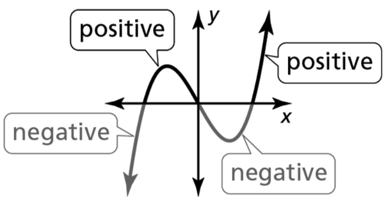
The graph appears to intersect the x-axis at $(-1, 0)$ and $(4, 0)$.
It appears to intersect the y-axis at $(0, -4)$.

▶ So, the x-intercepts are about -1 and 4, and the y-intercept is about -4.

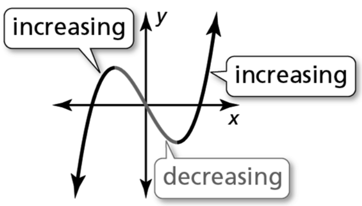
Key Idea

Positive, Negative, Increasing, Decreasing, and End Behavior

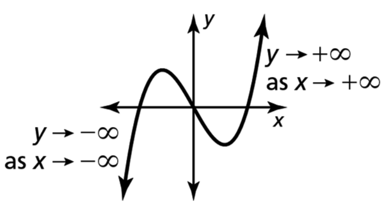
A function is *positive* when its graph lies above the x-axis. A function is *negative* when its graph lies below the x-axis.



A function is **increasing** when its graph moves up as x moves to the right. A function is **decreasing** when its graph moves down as x moves to the right.



The **end behavior** of a function is the behavior of the graph as x approaches positive infinity $(+\infty)$ or negative infinity $(-\infty)$.

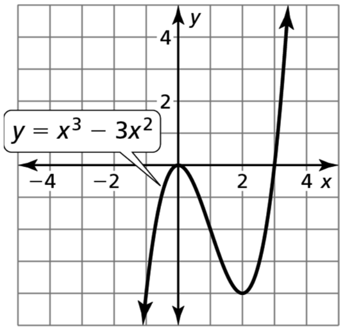


Name ____ Date __________

1.3 Reteach (continued)

EXAMPLE Describing Characteristics

Approximate when the function $y = x^3 - 3x^2$ is positive, negative, increasing, or decreasing. Then describe the end behavior of the function.



SOLUTION

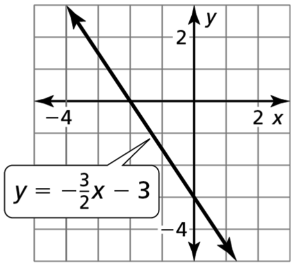
Positive and Negative: The function appears to be negative when $x < 0$, negative when $0 < x < 3$, and positive when $x > 0$.

Increasing and Decreasing: The function appears to be increasing when $x < 0$, decreasing when $0 < x < 2$, and increasing when $x > 2$.

End behavior: The graph shows that the function values decrease as x approaches negative infinity and the function values increase as x approaches positive infinity. So, $y \to -\infty$ as $x \to -\infty$ and $y \to +\infty$ as $x \to +\infty$.

In Exercises 1–4, estimate the intercepts of the graph of the function.

1.



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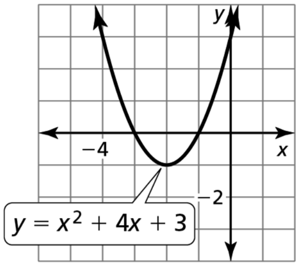

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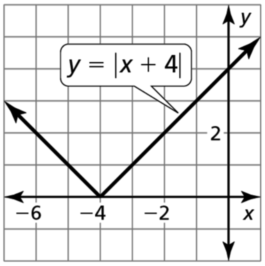

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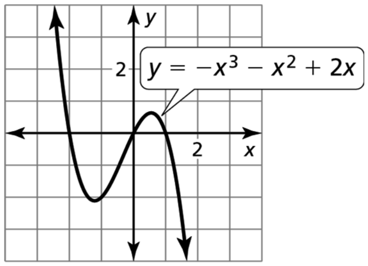
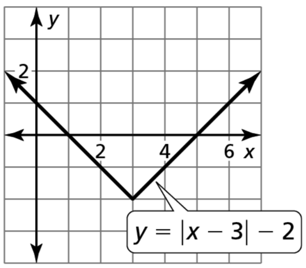


In Exercises 5 and 6, approximate when the function is positive, negative, increasing, or decreasing. Then describe the end behavior of the function.

5.



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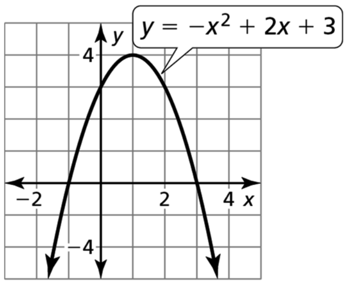


Name____ Date__________

1.3 Enrichment and Extension

Exploring Intercepts and End Behavior

1. Consider the equations $y = x^2$, $y = x^2 - 2x + 3$, and $y = x^2 + 2x - 2$.

a. Graph each equation in the same coordinate plane.

b. Will the graph of $y = x^2 + bx + c$, where b and c are real numbers, always have an x-intercept? y-intercept?

c. What do you think the end behavior of the graph of $y = x^2 + bx + c$, where b and c are real numbers, will be?

2. Consider the equations $y = -x^2$, $y = -x^2 + 2x - 3$, and $y = -x^2 - 2x + 2$.

a. Graph each equation in the same coordinate plane.

b. Will the graph of $y = -x^2 + bx + c$, where b and c are real numbers, always have an x-intercept? y-intercept?

c. What do you think the end behavior of the graph of $y = -x^2 + bx + c$, where b and c are real numbers, will be?

3. Consider the equations $y = x^3$, $y = x^3 - 2x^2$, and $y = x^3 - x^2 - 4x + 4$.

a. Graph each equation in the same coordinate plane.

b. Will the graph of $y = x^3 + bx^2 + cx + d$, where b, c, and d are real numbers, always have an x-intercept? y-intercept?

c. What do you think the end behavior of the graph of $y = x^3 + bx^2 + cx + d$, where b, c, and d are real numbers, will be?

4. Consider the equations $y = -x^3$, $y = -x^3 + 2x^2$, and $y = -x^3 + x^2 + 4x - 4$.

a. Graph each equation in the same coordinate plane.

b. Will the graph of $y = -x^3 + bx^2 + cx + d$, where b, c, and d are real numbers, always have an x-intercept? y-intercept?

c. What do you think the end behavior of the graph of $y = -x^3 + bx^2 + cx + d$, where b, c, and d are real numbers, will be?

5. Do you think the end behavior of the graph of $y = 2x^4 - 3x^3 + 2$ will most resemble the end behavior of the graph of $y = x^2$, $y = -x^2$, $y = x^3$, or $y = -x^3$?

6. Do you think the end behavior of the graph of $y = -3x^5 - 2x^3 + 2x$ will most resemble the end behavior of the graph of $y = x^2$, $y = -x^2$, $y = x^3$, or $y = -x^3$?

Name ______________________________ Date __________

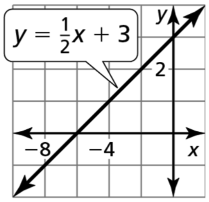
1.3 Puzzle Time

What's In The Middle Of America And Australia?

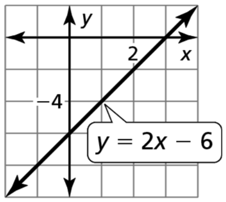
Write the letter of each answer in the box containing the exercise number.

Estimate the intercepts of the graph of the function.

1.



2.



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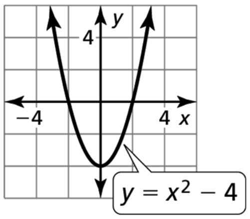

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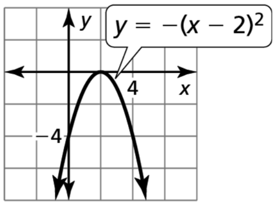

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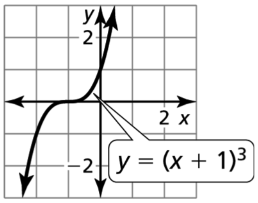

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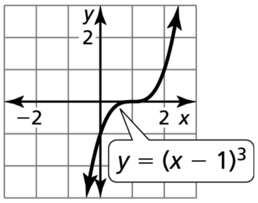
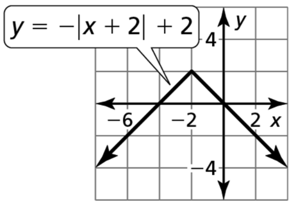


Approximate when the function is positive, negative, increasing, or decreasing. Then describe the end behavior of the function.

7.



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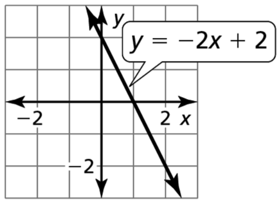

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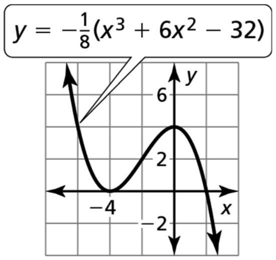
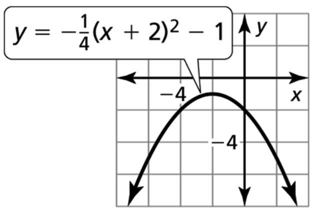


10.



2	3	10		1	6	5	8	4	7		9

Answers

E. x-intercept: about 1, y-intercept: about -1

T. x-intercept: about 3, y-intercept: about -6

L. x-intercept: about -6, y-intercept: about 3

T. x-intercept: about -1, y-intercept: about 1

E. x-intercept: about 2, y-intercept: about -4

H. x-intercepts: about -2 and 2, y-intercept: about -4

R. positive: $(-4, 0)$, negative: $(-\infty, -4)$ and $(0, \infty)$, increasing: $(-\infty, -2)$, decreasing: $(-2, \infty)$; $y \to -\infty$ as $x \to +\infty$ and $y \to -\infty$ as $x \to -\infty$

E. negative: for all real numbers, increasing: $x < -2$, decreasing: $x > -2$; $y \to -\infty$ as $x \to +\infty$ and $y \to -\infty$ as $x \to -\infty$

R. positive: $(-\infty, -4)$ and $(-4, 2)$, negative: $(2, \infty)$, increasing: $(-4, 0)$, decreasing: $(-\infty, -4)$ and $(0, \infty)$; $y \to -\infty$ as $x \to +\infty$ and $y \to +\infty$ as $x \to -\infty$

T. positive: $x < 1$, negative: $x > 1$, decreasing: for all real numbers; $y \to -\infty$ as $x \to +\infty$ and $y \to +\infty$ as $x \to -\infty$

Name____ Date__________

1.4 Cumulative Practice
For use before Lesson 1.4

Solve the inequality. Graph the solution.

1. $8x \le 24$

2. $5x \le 35$

1.4 Prerequisite Skills Practice
For use before Lesson 1.4

Plot the coordinates from the table in a coordinate plane. Connect them with a line or smooth curve.

1.

x	3	4	5	6
y	2	1	0	–1

2.

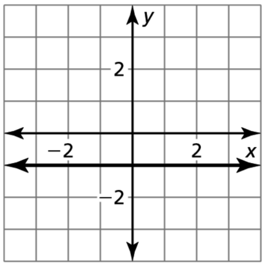
x	5	6	7	8
y	35	28	29	31

Name ______________________________ Date __________

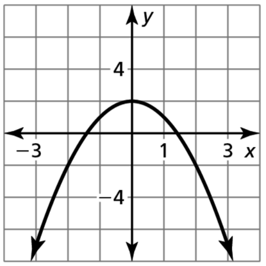
1.4 Extra Practice

In Exercises 1–8, determine whether the graph, table, or equation represents a *linear* or *nonlinear* function. Explain.

1.



2.



3.

x	0	2	4	6
y	3	9	27	81

4.

x	14	24	34	44
y	24	20	16	12

5. $y - \frac{1}{3}x = 4x - 7$

6. $6 - \frac{2}{5}x = 3y + 8x$

7. $(y + 2)(y - 4) = 3x$

8. $4x - 5y + 2xy = 0$

In Exercises 9 and 10, determine whether the domain is *discrete* or *continuous*. Explain.

9.

Input **Time (months), *x***	1	2	3
Output **Height of basil plant (inches), *y***	3	7	11

10.

Input **Tickets, *x***	10	20	30
Output **Cost (dollars), *y***	60	120	180

11. You are driving from your house to a friend's house at a constant speed. The linear function $y = 175 - 50x$ represents the distance y (in miles) you are from your friend's house after driving x hours.

a. Interpret the terms and coefficients in the equation.

b. Find the domain of the function. Is the domain discrete or continuous? Explain.

c. Graph the function using its domain.

Name____ Date__________

1.4 Reteach

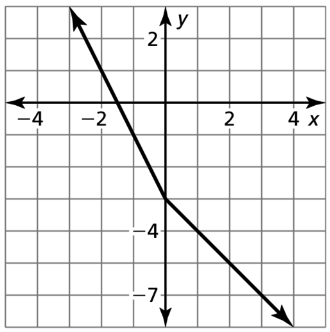
A **linear equation in two variables**, x and y, is an equation that can be written in the form

$$y = mx + b$$

where m and b are constants. The graph of a linear equation is a line. Likewise, a **linear function** is a function whose graph is a nonvertical line. A linear function has a constant rate of change and can be represented by a linear equation in two variables. A **nonlinear function** does not have a constant rate of change. So, its graph is *not* a line.

EXAMPLE Identifying a Linear Function Using a Graph

Does the graph represent a *linear* or *nonlinear* function? Explain.



SOLUTION

The graph is *not* a line. The rate of change of the graph to the left of the y-axis is not the same as the rate of change of the graph to the right of the y-axis.

▶ So, the function is nonlinear.

EXAMPLE Identifying a Linear Function Using a Table

Does the table represent a *linear* or *nonlinear* function? Explain.

x	1	3	5	7
y	3	8	13	18

SOLUTION

Determine whether the rate of change is constant.

+ 2 **+ 2** **+ 2**

x	1	3	5	7
y	3	8	13	18

+ 5 **+ 5** **+ 5**

As x increases by 2, y increases by 5. The rate of change is constant.

▶ So, the function is linear.

Name ____ Date __________

1.4 Reteach (continued)

EXAMPLE Identifying Linear Functions Using Equations

Which of the following equations represent linear functions? Explain.

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

SOLUTION

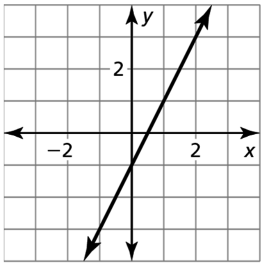
You cannot rewrite the equations $y = \frac{2}{x}$, $y = 2xy + 1$, and $x^2 = y + 2$ in the form $y = mx + b$. These functions do not have a constant rate of change. So, they cannot represent linear functions.

▶ You can rewrite the equation $2y = -3x - 1$ as $y = -\frac{3}{2}x - \frac{1}{2}$ and the equation $-2(3x - 1) = y$ as $y = -6x + 2$. These functions have a constant rate of change.

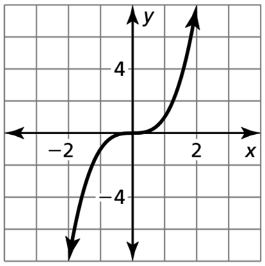
So, they represent linear functions.

In Exercises 1 and 2, determine whether the graph represents a *linear* or *nonlinear* function. Explain.

1.



2.



In Exercises 3 and 4, determine whether the table represents a *linear* or *nonlinear* function. Explain.

3.

x	0	1	2	3
y	3	5	7	9

4.

x	1	4	7	10
y	2	5	6	10

In Exercises 5–8, determine whether the equation represents a *linear* or *nonlinear* function. Explain.

5. $y = 4x - 2$

6. $y = \frac{5}{x} + 5$

7. $y = \sqrt{x} + 5$

8. $2y = 18 - 2x$

Name____ Date__________

1.4 Enrichment and Extension

Linear Functions: Taking a Taxi

You take a trip to downtown Boston to walk the Freedom Trail with your family. After you walk through the Bunker Hill Memorial, your family decides to take a taxi to a restaurant for dinner. After 1 mile, the meter on the taxi says $4.75. It will cost $8.25 to go 3 miles. The cost varies linearly with the distance that you traveled.

a. Write the linear function that models the cost of your trip as a function of the distance traveled. Use the notation $C(d)$.

b. Write the function using improper fractions.

c. How much would it cost you to travel 10 miles in a taxi?

d. How far can you travel if you only have $10 to spend?

e. Calculate the cost-intercept. What does this number represent?

f. Plot the graph of this linear function. What is a suitable domain for this problem? What is a suitable range?

g. What is the slope of the line? Show how to find it both graphically and algebraically.

h. What does the slope of the line represent?

i. Write your own linear function word problem, and prove that it works graphically and algebraically.

Name ____ Date __________

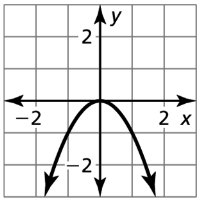
1.4 Puzzle Time

What Do You Get When You Cross A Tortoise And A Porcupine?

Write the letter of each answer in the box containing the exercise number.

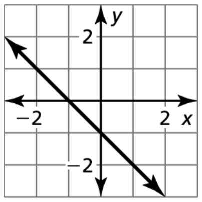
Determine whether the graph, table, or equation represents a *linear* or *nonlinear* function.

1.



D. linear **E.** nonlinear

2.



O. linear **P.** nonlinear

3.

x	2	4	6	8
y	21	18	15	12

A. linear **B.** nonlinear

4.

x	−13	−9	−5	−1
y	27	30	27	22

N. linear **O.** nonlinear

5. $y = \frac{1}{7}(x - 28) + 16$

W. linear **X.** nonlinear

6. $y = -2x^2 + 7$

K. linear **L.** nonlinear

7. $y = 14 - \frac{1}{5}x$

P. linear **Q.** nonlinear

8. $3 - \frac{1}{9}y = 8x - 11$

K. linear **L.** nonlinear

9. The function $y = 16 + 0.75x$ represents the cost y (in dollars) of a large pizza with x extra toppings.

S. linear **T.** nonlinear

3		9	6	2	5	7	4	8	1

Name____ Date__________

1.5 Cumulative Practice
For use before Lesson 1.5

Solve the inequality. Graph the solution.

1. $-8x + 3 > -45$

2. $-5x + 6 < -29$

1.5 Prerequisite Skills Practice
For use before Lesson 1.5

Evaluate the expression for $x = -12$, 0, and 3.

1. $-x - 3$

2. $2x + 2$

Name ______________________________ Date __________

1.5 Extra Practice

In Exercises 1–3, evaluate the function when $x = -2$, 0, and 5.

1. $f(x) = 1.5x + 1$ **2.** $g(x) = 11 - 3x + 2$ **3.** $h(x) = -3 - x - 2$

4. Let $g(x)$ be the percent of your friends with a social media account x years after 2015. Explain the meaning of each statement.

a. $g(0) = 3$ **b.** $g(1) = g(2)$

c. $g(3) = m$ **d.** $g(5) > g(4)$

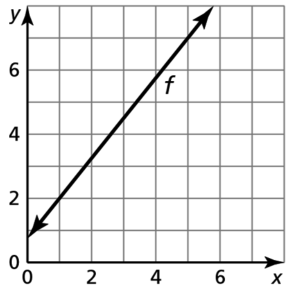
In Exercises 5–8, find the value of *x* so that the function has the given value.

5. $f(x) = 8x - 7; f(x) = 17$ **6.** $g(x) = -4x + 7; g(x) = 27$

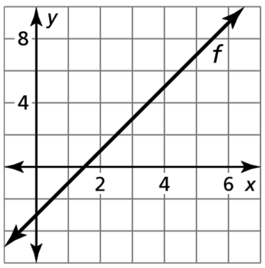
7. $f(x) = \frac{1}{3}x - 1; f(x) = 9$ **8.** $h(x) = 6 - \frac{2}{3}x; h(x) = -2$

In Exercises 9 and 10, find the value of *x* so that $f(x) = 7$.

9.



10.



In Exercises 11–14, graph the linear function.

11. $h(x) = -\frac{3}{2}x + 4$ **12.** $p(x) = \frac{1}{4}x - 1$

13. $v(x) = -5 + 2x$ **14.** $k(x) = 4 - 3x$

15. The function $C(x) = 35x + 75$ represents the labor cost (in dollars) for Bob's Auto Repair to replace your alternator, where x is the number of hours of labor. The table shows sample labor costs from its main competitor, Budget Auto Repair. The alternator is estimated to take 5 hours of labor. Which company would you hire? Explain.

Hours	1	2	3
Cost	\$90	\$130	\$170

Name____ Date__________

1.5 Reteach

You learned that a linear function can be written in the form $y = mx + b$. By naming a linear function *f*, you can also write the function using **function notation**.

$f(x) = mx + b$ Function notation

The notation $f(x)$ is another name for *y*. If *f* is a function, and *x* is in its domain, then $f(x)$ represents the output of *f* corresponding to the input *x*. You can use letters other than *f* to name a function, such as *g* or *h*.

EXAMPLE Evaluating a Function

Evaluate $f(x) = -3x - 7$ when $x = 0$ and $x = -4$.

SOLUTION

$f(x) = -3x - 7$	Write the function.	$f(x) = -3x - 7$
$f(0) = -3(0) - 7$	Substitute for *x*.	$f(-4) = -3(-4) - 7$
$= 0 - 7$	Multiply.	$= 12 - 7$
$= -7$	Subtract.	$= 5$

▶ When $x = 0$, $f(x) = -7$, and when $x = -4$, $f(x) = 5$.

EXAMPLE Solving for the Independent Variable

For $h(x) = -2x + 8$, find the value of *x* for which $h(x) = 14$.

SOLUTION

$h(x) = -2x + 8$	Write the function.
$14 = -2x + 8$	Substitute 14 for *h*(*x*).
$\underline{-8} = \underline{\quad -8}$	Subtract 8 from each side.
$6 = -2x$	Simplify.
$\dfrac{6}{-2} = \dfrac{-2x}{-2}$	Divide each side by –2.
$-3 = x$	Simplify.

▶ When $x = -3$, $h(x) = 14$.

Name ______________________________ Date __________

1.5 Reteach (continued)

EXAMPLE Graphing a Linear Function in Function Notation

Graph $f(x) = -3x - 1$.

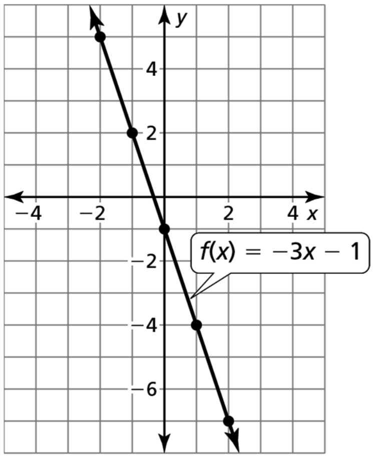
SOLUTION

Step 1 Make an input-output table to find ordered pairs.

x	-2	-1	0	1	2
$f(x)$	5	2	-1	-4	-7

Step 2 Plot the ordered pairs.

Step 3 Draw a line through the points.



In Exercises 1–6, evaluate the function when $x = -2$, 0, and 5.

1. $f(x) = x - 3$

2. $g(x) = -2x$

3. $h(x) = 5 - 3x$

4. $h(x) = -\frac{3}{2}x - \frac{1}{2}$

5. $j(x) = 2.5x + 5$

6. $n(x) = \frac{1}{5}x + \frac{1}{2}$

In Exercises 7–10, find the value of x so that the function has the given value.

7. $f(x) = 6x$; $f(x) = -24$

8. $g(x) = -10x$; $g(x) = 15$

9. $f(x) = 3x - 5$; $f(x) = 4$

10. $h(x) = 14 - 8x$; $h(x) = -2$

In Exercises 11–14, graph the linear function.

11. $r(x) = 2$

12. $g(x) = -3x$

13. $g(x) = \frac{2}{5}x - 3$

14. $j(x) = -\frac{1}{3}x + 5$

Name____ Date__________

1.5 Enrichment and Extension

Composition of Functions

Function Composition, $f(g(x))$ or $(f \circ g)(x)$, is applying the results of one function to the results of another. To perform a composition, you must combine the functions so that the output of one function becomes the input of another.

Example: If $f(x) = -x - 3$ and $g(x) = 2x + 7$, find $f(g(x))$ and $g(f(x))$.

$$\begin{aligned} f(g(x)) &= f(2x + 7) \\ &= -(2x + 7) - 3 \\ &= -2x - 7 - 3 \\ &= -2x - 10 \end{aligned} \qquad \begin{aligned} g(f(x)) &= g(-x - 3) \\ &= 2(-x - 3) + 7 \\ &= -2x - 6 + 7 \\ &= -2x + 1 \end{aligned}$$

In Exercises 1–4, perform the indicated composition if $g(x) = 3x + 1$, $h(x) = -4x - 5$, and $p(x) = x^2$.

1. $h(g(x))$ **2.** $(g \circ g)(x)$ **3.** $h(g(p(x)))$ **4.** $g(p(-5))$

5. You work 40 hours a week at a high-end clothing store. You make \$180 every week plus 3% commission on sales over \$600. Assume you sell enough this week to earn a commission. Given the functions $f(x) = 0.03x$ and $g(x) = x - 600$, which composition of $(f \circ g)(x)$ or $(g \circ f)(x)$ represents your commission?

6. You make a purchase at a local furniture store, but the furniture you buy is too big to bring home yourself, so you have to have it delivered for a small fee. You pay for your purchase plus the sales tax and the fee. The sales tax is 7% while the fee is \$40.

a. Write a function $p(x)$ for the total purchase, including only the delivery fee.

b. Write a function $t(x)$ for the total purchase, including only tax and not the delivery fee.

c. Calculate $(p \circ t)(x)$ and $(t \circ p)(x)$. Then interpret both. Which results in a lower cost?

d. If the furniture store is not allowed to tax the delivery fee, which is the appropriate composition for your situation?

Name ______________________________ Date __________

1.5 Puzzle Time

How Does A Bee Get To School?

Circle the letter of each correct answer in the boxes below. The circled letters will spell out the answer to the riddle.

Evaluate the function for the given value of *x*.

1. $g(x) = x - 7;\ x = 4$

2. $f(x) = -2x;\ x = -6$

3. $k(x) = -\frac{3}{4}x - 11;\ x = -12$

4. $t(x) = 9x + 10;\ x = -\frac{1}{6}$

5. $g(x) = 15 - \frac{7}{8}x;\ x = 24$

6. $c(x) = 0.25x - 3;\ x = 10$

7. $w(x) = 21 - 6x - 13;\ x = \frac{1}{2}$

8. $p(x) = -\frac{1}{4}(x + 36) - 14;\ x = -8$

Find the value of *x* so that the function has the given value.

9. $b(x) = 8x;\ b(x) = -56$

10. $h(x) = -\frac{5}{6}x;\ h(x) = 10$

11. $n(x) = 16 - 0.5x;\ n(x) = 48$

12. $r(x) = \frac{8}{9}x - 17;\ r(x) = 15$

13. $s(x) = -3\left(x - \frac{2}{3}\right) + 19;\ s(x) = 0$

14. The local cable company charges \$90 per month for basic cable and \$12 per month for each additional premium cable channel. The function $c(x) = 90 + 12x$ represents the monthly charge (in dollars), where x is the number of additional premium channels. How many additional premium channels would you have ordered if your bill was \$114 per month?

B	**I**	**V**	**T**	**K**	**T**	**C**	**A**	**J**	**E**	**K**	**I**	**G**	**E**	**O**	**S**
4	5	−10	$\frac{17}{2}$	15	36	3	12	9	0	−21	−4	−13	−7	20	−6
M	**T**	**N**	**H**	**S**	**E**	**D**	**B**	**R**	**U**	**F**	**A**	**Z**	**Q**	**P**	**Z**
13	−0.5	25	2	−9	−2	−1	7	10	−12	−15	−25	−3	1	26	−64

Name____ Date__________

1.6 Cumulative Practice
For use before Lesson 1.6

1. Two shops rent canoes for a rental fee plus a fee per hour. How many hours must a canoe be rented for the total costs to be the same?

Shop A	Shop B
Rental fee: $6	Rental fee: $9
Hourly fee: $4	Hourly fee: $3

2. Two shops rent kayaks for a rental fee plus a fee per hour. How many hours must a kayak be rented for the total costs to be the same?

Shop A	Shop B
Rental fee: $5	Rental fee: $9
Hourly fee: $5	Hourly fee: $3

1.6 Prerequisite Skills Practice
For use before Lesson 1.6

Write a rule to relate the variables in the table.

1.

x	0	2	4	6
y	1.5	1.3	1.1	0.9

2.

x	1	2	3	4
y	9	15	21	27

Name ____ Date __________

1.6 Extra Practice

In Exercises 1–3, graph the linear equation.

1. $y = 1$

2. $x = -4$

3. $y = 0$

In Exercises 4–7, find the *x*- and *y*-intercepts of the graph of the linear equation.

4. $-5x + 7y = -35$

5. $-6x - 9y = 54$

6. $4x - 3y = 1$

7. $x - 5y = 2$

In Exercises 8–13, use intercepts to graph the linear equation. Label the points corresponding to the intercepts.

8. $-6x + 3y = -18$

9. $-3x + 8y = -24$

10. $-x + 4y = 9$

11. $2x - y = 3$

12. $-\frac{1}{3}x + y = -3$

13. $-\frac{3}{2}x + y = 15$

14. You have a budget of $150 to order gifts for your club. The equation $5x + 2y = 150$ models the total cost, where x is the number of key chains and y is the number of wristbands.

a. Interpret the terms and coefficients in the equation.

b. Graph the equation. Interpret the intercepts.

c. Your club decides to order 18 key chains. How many wristbands can you order?

15. Describe and correct the error in finding the intercepts of the graph of the linear equation $6x + 9y = 18$.

✗

$$\begin{aligned} 6x + 9y &= 18 \\ 6x + 9(0) &= 18 \\ 6x &= 18 \\ x &= 3 \end{aligned} \qquad \begin{aligned} 6x + 9y &= 18 \\ 6(0) + 9y &= 18 \\ 9y &= 18 \\ y &= 2 \end{aligned}$$

The x-intercept is at $(0, 3)$, and the y-intercept is at $(2, 0)$.

16. Write an equation, in standard form, of a line whose x-intercept is an integer and y-intercept is a fraction. Explain how you know that the x-intercept is an integer and the y-intercept is a fraction.

Name____ Date__________

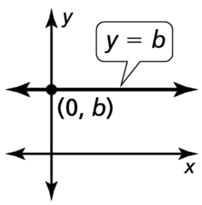
1.6 Reteach

The **standard form** of a linear equation is $Ax + By = C$, where A, B, and C are real numbers and A and B are not both zero.

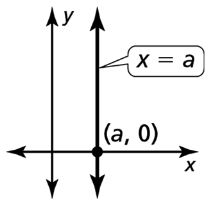
Consider what happens when $A = 0$ or when $B = 0$. When $A = 0$, the equation becomes $By = C$, or $y = \frac{C}{B}$. Because $\frac{C}{B}$ is a constant, you can write $y = b$. Similarly, when $B = 0$, the equation becomes $Ax = C$, or $x = \frac{C}{A}$, and you can write $x = a$.

Key Ideas

Horizontal and Vertical Lines



The graph of $y = b$ is a horizontal line. The line passes through the point $(0, b)$.



The graph of $x = a$ is a vertical line. The line passes through the point $(a, 0)$.

EXAMPLE Graphing Horizontal and Vertical Lines

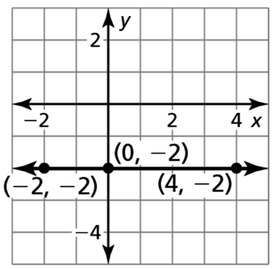
Graph each linear equation.

a. $y = -2$

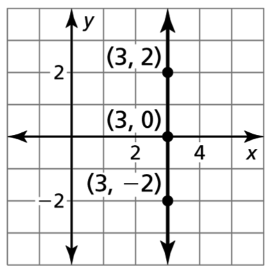
b. $x = 3$

SOLUTION

a. For every value of x, the value of y is -2. The graph of the equation $y = -2$ is a horizontal line 2 units below the x-axis.



b. For every value of y, the value of x is 3. The graph of the equation $x = 3$ is a vertical line 3 units to the right of the y-axis.



Name ____ Date __________

1.6 Reteach (continued)

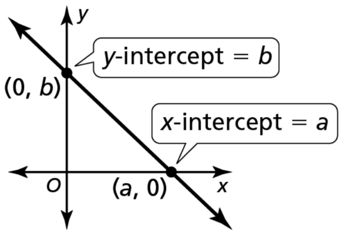
You can use the fact that two points determine a line to graph a linear equation. Two convenient points are the x- and y-intercepts.

Key Idea

Using Intercepts to Graph Equations

To graph the linear equation $Ax + By = C$ using intercepts, find the intercepts and draw the line that passes through them.

- To find the x-intercept, let $y = 0$ and solve for x.
- To find the y-intercept, let $x = 0$ and solve for y.



EXAMPLE Using Intercepts to Graph a Linear Equation

Use intercepts to graph the equation $10x + 2y = 10$.

SOLUTION

Step 1 Find the intercepts.

To find the x-intercept, substitute 0 for y and solve for x.

$10x + 2y = 10$	Write the original equation.
$10x + 2(0) = 10$	Substitute 0 for y.
$x = 1$	Solve for x.

To find the y-intercept, substitute 0 for x and solve for y.

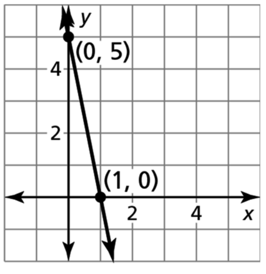
$10x + 2y = 10$	Write the original equation.
$10(0) + 2y = 10$	Substitute 0 for x.
$y = 5$	Solve for y.

Step 2 Plot the points and draw the line.

The x-intercept is 1, so plot the point $(1, 0)$.

The y-intercept is 5, so plot the point $(0, 5)$.

Draw a line through the points.



In Exercises 1–3, graph the linear equation.

1. $x = 1$ **2.** $y = 3$ **3.** $x = -3$

In Exercises 4–7, use intercepts to graph the linear equation. Label the points corresponding to the intercepts.

4. $2x + 4y = 8$ **5.** $3x + 2y = 12$ **6.** $-5x + 2y = 20$

Name____ Date __________

1.6 Enrichment and Extension

Challenge: *x*- and *y*-intercepts

In Exercises 1–12, find the *x*- and *y*-intercepts for the given equation. Assume that *a*, *b*, and *c* are all nonzero real numbers.

1. $ax + by = c$

2. $2ax + 2by = 4c$

3. $2ax + by = c$

4. $c + ax + by = c$

5. $ax + 2by - c = -2$

6. $x + by + c = 5c - 2$

7. $\frac{2}{a}x + \frac{b}{3}y = 6c$

8. $\frac{2}{5}x + \frac{1}{3}y = \frac{1}{15}$

9. $-5x + \frac{4}{5}y = \frac{c}{2}$

10. $\frac{1}{2}x - \frac{1}{4}y = -7$

11. $a^2x + 3by = 6a^3b^2$

12. $2.25x + 1.5y = 3.75$

Name ____ Date __________

1.6 Puzzle Time

Why Did The Horse Go To The Doctor?

Write the letter of each answer in the box containing the exercise number.

Find the *x*- and *y*-intercepts of the graph of the linear equation.

1. $3x + 4y = 24$
2. $-4x - 6y = 12$
3. $x + 9y = 36$
4. $-2x + 5y = -10$
5. $y = 3$
6. $7x - 2y = 28$
7. $-\frac{1}{4}x + 2y = 8$
8. $\frac{1}{6}x - \frac{1}{3}y = 9$
9. $x = -14$
10. $13x - 14y = -26$
11. The student council is responsible for setting up the tables for an awards banquet at the end of the year. There are 144 people who confirmed that they would attend the banquet. The equation $8x + 12y = 144$ models this situation, where x is the number of circular tables and y is the number of rectangular tables. Find the x- and y-intercepts.

9	3	5		11	4	6		8	1	10	2	7

Answers

E. x-intercept: $(-3, 0)$; y-intercept: $(0, -2)$

R. x-intercept: $(-32, 0)$; y-intercept: $(0, 4)$

Y. x-intercept: $(4, 0)$; y-intercept: $(0, -14)$

O. x-intercept: $(36, 0)$; y-intercept: $(0, 4)$

F. x-intercept: $(-14, 0)$; y-intercept: none

A. x-intercept: $(5, 0)$; y-intercept: $(0, -2)$

V. x-intercept: $(-2, 0)$; y-intercept: $\left(0, \frac{13}{7}\right)$

R. x-intercept: none; y-intercept: $(0, 3)$

H. x-intercept: $(18, 0)$; y-intercept: $(0, 12)$

F. x-intercept: $(54, 0)$; y-intercept: $(0, -27)$

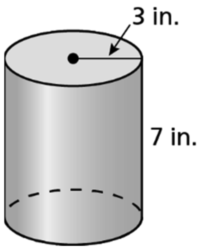
E. x-intercept: $(8, 0)$; y-intercept: $(0, 6)$

Name____ Date__________

1.7 Cumulative Practice
For use before Lesson 1.7

Find the volume of the cylinder.

1.



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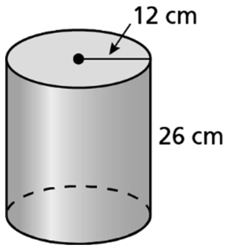


1.7 Prerequisite Skills Practice
For use before Lesson 1.7

Make a table of points and plot them in a coordinate plane. Connect the points with a line.

1. $y = -2x - 3$

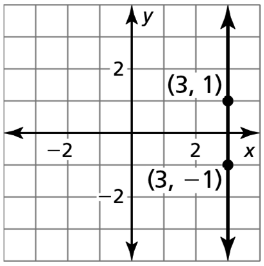
2. $y = 6x + 6$

Name ______________________________________ Date __________

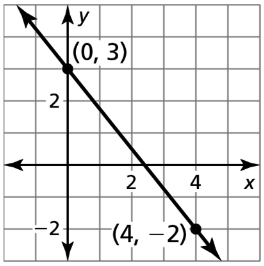
1.7 Extra Practice

In Exercises 1 and 2, describe the slope of the line. Then find the slope.

1.



2.



In Exercises 3 and 4, the points represented by the table lie on a line. Find the slope of the line.

3.

x	4	4	4	4
y	−2	1	4	7

4.

x	3	1	−1	−3
y	−4	1	6	11

In Exercises 5–8, find the slope and the *y*-intercept of the graph of the linear equation.

5. $y = 12$

6. $-3x + y = 7$

7. $-4x = 9 - 2y$

8. $0 = 2 - 3y + 12x$

In Exercises 9–12, graph the linear equation. Identify the *x*-intercept.

9. $y = x$

10. $x + 3y = 9$

11. $-y + 2x = 0$

12. $3x - y + 1 = 0$

13. A linear function g models the growth of your hair. On average, the length of a hair strand increases 1.25 centimeters every month. Graph g when $g(0) = 10$. Identify the slope and interpret the y-intercept of the graph.

14. A linear function w models the amount of water dripping from a bucket. Every minute, 5 millimeters of water drips out of the bucket. Graph w when $w(0) = 1500$. Identify the slope and interpret the intercepts of the graph.

In Exercises 15 and 16, find the value of *k* so that the graph of the equation has the given slope or *y*-intercept.

15. $y = 6kx - 2;\ m = \frac{2}{3}$

16. $y = -\frac{1}{2}x + \frac{4}{3}k;\ b = -8$

Name____ Date__________

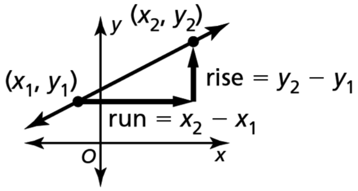
1.7 Reteach

Key Idea

Slope

The **slope** m of a nonvertical line passing through two points (x_1, y_1) and (x_2, y_2) is the value of the ratio of the **rise** (change in y) to the **run** (change in x).

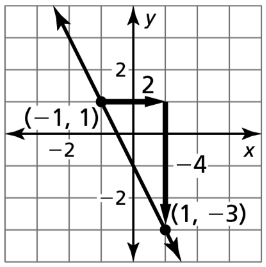
$$\text{slope} = m = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}$$



When the line rises from left to right, the slope is positive.
When the line falls from left to right, the slope is negative.

EXAMPLE Finding the Slope of a Line

Describe the slope of the line. Then find the slope.



SOLUTION

The line falls from left to right. So, the slope is negative.

To find the slope by using the graph, start from a higher point on the graph, and move to a lower point. From the higher point, the line runs 2 to the right and falls 4.

$$\text{slope} = m = \frac{\text{rise}}{\text{run}} = \frac{-4}{2} = -2$$

To calculate the slope algebraically, let $(x_1, y_1) = (-1, 1)$ and $(x_2, y_2) = (1, -3)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - 1}{1 - (-1)} = \frac{-4}{2} = -2$$

▶ The solution is -2.

EXAMPLE Finding the Slope from a Table

The points represented by the table lie on a line. How can you find the slope of the line from the table? What is the slope of the line?

x	5	6	7
y	−2	0	2

SOLUTION

Choose any two points from the table and use the slope formula. Let $(x_1, y_1) = (6, 0)$ and let $(x_2, y_2) = (7, 2)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 0}{7 - 6} = \frac{2}{1} = 2$$

▶ The solution is 2.

Name ______________________________ Date __________

1.7 Reteach (continued)

Key Idea

Slope-Intercept Form

Words A linear equation written in the form $y = mx + b$ is in **slope-intercept form**. The slope of the line is m, and the y-intercept of the line is b.

Algebra $y = \underbrace{m}_{\text{slope}}x + \underbrace{b}_{y\text{-intercept}}$

A linear equation written in the form $y = 0x + b$, or $y = b$, is a **constant function**. The graph of a constant function is a horizontal line.

EXAMPLE Identifying a Slope and a y-Intercept

Find the slope and the y-intercept of the graph of $y = 5x - 1$.

SOLUTION

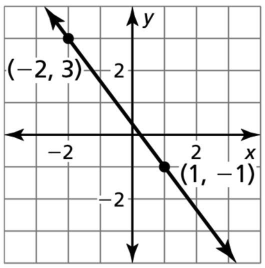
$y = mx + b$ Write the slope-intercept form.

$y = 5x + (-1)$ Rewrite the original equation to show subtracting 1 as adding negative 1.

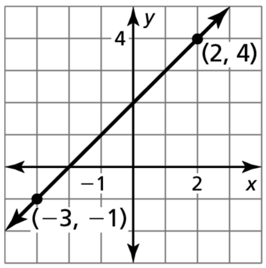
▶ The slope is 5, and the y-intercept is -1.

In Exercises 1 and 2, describe the slope of the line. Then find the slope.

1.



2.



In Exercises 3 and 4, the points represented by the table lie on a line. Find the slope of the line.

3.

x	–2	1	4	7
y	0	1	2	3

4.

x	0	2	5	7
y	3	3	3	3

In Exercises 5–8, find the slope and the *y*-intercept of the graph of the linear equation.

5. $y = -6x + 2$ **6.** $y = 7x$ **7.** $y = -3$ **8.** $x - y = 9$

Name____ Date__________

1.7 Enrichment and Extension

Challenge: Slope and Slope-Intercept Form

In Exercises 1–4, find the slope of the line through the given points. Assume that *a* and *b* are nonzero real numbers.

1. (a, b) and $(-2, 1)$

2. $(2a, 3b)$ and $(-2a, b)$

3. (a, b) and (b, a)

4. $(5a, b)$ and $(-5b, -a)$

Two lines are *parallel* if they both have the same slope. Two nonvertical lines are *perpendicular* if the product of their slopes is –1. Vertical lines are perpendicular to horizontal lines. In Exercises 5–8, find the value of *x* so that the line through the pair of points is *parallel* to a line with the slope given. Then find the value of *x* so that the line through the pair of points is *perpendicular* to a line with the slope given.

5. $m = \frac{1}{2}$; $(-3, x)$ and $(1, 4)$

6. $m = 0$; $(x, -3)$ and $(5, x)$

7. $m = -3$; $(3, -2x)$ and $(-4, 5)$

8. $m = \frac{5}{4}$; $(-1, 4)$ and $(x, -2)$

Name ______________________________ Date __________

1.7 Puzzle Time

What Did The Pelican Say When It Finished Shopping?

Write the letter of each answer in the box containing the exercise number.

Find the slope of the line that passes through the given points.

1. $(-10, -12), (-8, -8), (-6, -4), (-4, 0)$
2. $(-4, 2), (0, 1), (4, 0), (8, -1)$
3. $(-7, -7), (0, -8), (7, -9), (14, -10)$
4. $(-2, 2), (0, 3), (2, 4), (4, 5)$
5. $(2, -11), (4, -25), (6, -39), (8, -53)$
6. $(-11, -38), (-5, -14), (1, 10), (7, 34)$

Find the slope and the *y*-intercept of the graph of the linear equation.

7. $y = -4x + 6$
8. $y = -\frac{1}{4}$
9. $4x + y = -1$
10. $y = 6x - 4$
11. $-x - 4y + 8 = 0$
12. $2x - 12y + 10 = 0$
13. The function $C(x) = 8x + 50$ represents the cost C (in dollars) of towing a vehicle, where x is the number of miles the vehicle is towed. Identify the slope and y-intercept.

Answers

I. $m = \frac{1}{2}$

M. $m = 6, b = -4$

U. $m = -\frac{1}{4}$

N. $m = -4, b = -1$

P. $m = -4, b = 6$

I. $m = -7$

L. $m = -\frac{1}{4}, b = 2$

O. $m = 2$

L. $m = 4$

T. $m = 0, b = -\frac{1}{4}$

B. $m = 8, b = 50$

Y. $m = -\frac{1}{7}$

T. $m = \frac{1}{6}, b = \frac{5}{6}$

7	2	12		5	8		1	9		10	3		13	4	11	6

Name____________________ Date__________

1.8 Cumulative Practice
For use before Lesson 1.8

Solve the equation.

1. $2x + 42 = 9x$

2. $4x + 49 = -3x$

1.8 Prerequisite Skills Practice
For use before Lesson 1.8

Evaluate the function for the given value of *x*.

1. $f(x) = 8x + 3; x = \frac{1}{4}$

2. $g(x) = \frac{3}{2}x - 7; x = 16$

Name ______________________________ Date __________

1.8 Extra Practice

In Exercises 1 and 2, use the graphs of *f* and *g* to describe the transformation from the graph of *f* to the graph of *g*.

1. $f(x) = -x - 3;\ g(x) = f(x + 5)$

2. $f(x) = \frac{1}{3}x - 2;\ g(x) = f(x - 6)$

3. The total cost C (in dollars) to rent a 14-foot by 20-foot canopy for d days is represented by $C(d) = 15d + 30,$ where the set-up fee is \$30 and the charge per day is \$15. The set-up fee increases by \$20. The new total cost T is represented by $T(d) = C(d) + 20.$ Describe the transformation from the graph of C to the graph of T.

In Exercises 4 and 5, use the graphs of *f* and *h* to describe the transformation from the graph of *f* to the graph of *h*.

4. $f(x) = -3 - x;\ h(x) = f(-x)$

5. $f(x) = \frac{1}{3}x + 1;\ h(x) = -f(x)$

In Exercises 6 and 7, use the graphs of *f* and *r* to describe the transformation from the graph of *f* to the graph of *r*.

6. $f(x) = 5x - 10;\ r(x) = f\left(\frac{2}{5}x\right)$

7. $f(x) = -\frac{1}{3}x + 2;\ r(x) = 6f(x)$

In Exercises 8–11, use the graphs of *f* and *g* to describe the transformation from the graph of *f* to the graph of *g*.

8. $f(x) = -3x + 5;\ g(x) = f(x - 3)$

9. $f(x) = -2x + 6;\ g(x) = f\left(\frac{4}{3}x\right)$

10. $f(x) = 4x - 3;\ g(x) = \frac{1}{2}f(x)$

11. $f(x) = -2x;\ g(x) = f(x) + 3$

In Exercises 12 and 13, write a function *g* in terms of *f* so that the statement is true.

12. The graph of g is a horizontal shrink by a factor of $\frac{2}{3}$ of the graph of f.

13. The graph of g is a horizontal translation 5 units left of the graph of f.

In Exercises 14–17, graph *f* and *h*. Describe the transformations from the graph of *f* to the graph of *h*.

14. $f(x) = x;\ h(x) = -2x + 1$

15. $f(x) = x;\ h(x) = \frac{3}{2}x + 2$

16. $f(x) = 2x;\ h(x) = 8x - 3$

17. $f(x) = 3x;\ h(x) = -3x - 5$

Name____ Date___________

1.8 Reteach

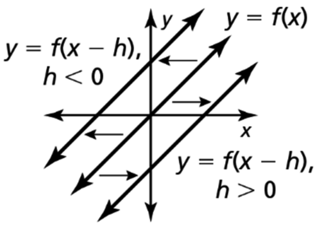
A **family of functions** is a group of functions with similar characteristics. The most basic function in a family of functions is the **parent function**. For nonconstant linear functions, the parent function is $f(x) = x$. The graphs of all other nonconstant linear functions are *transformations* of the graph of the parent function. A **transformation** changes the size, shape, position, or orientation of a graph.

Key Idea

A **translation** is a transformation that shifts a graph horizontally or vertically.

Horizontal Translations

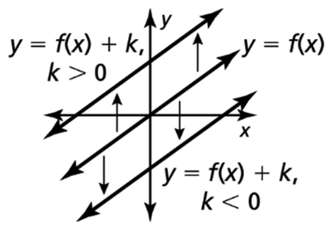
The graph of $y = f(x - h)$ is a horizontal translation of the graph of $y = f(x)$, where $h \neq 0$.



Subtracting h from the *inputs* before evaluating the function shifts the graph left when $h < 0$ and right when $h > 0$.

Vertical Translations

The graph of $y = f(x) + k$ is a vertical translation of the graph of $y = f(x)$, where $k \neq 0$.



Adding k to the *outputs* shifts the graph down when $k < 0$ and up when $k > 0$.

EXAMPLE Describing Horizontal and Vertical Translations

Let $f(x) = x + 2$. Graph (a) $g(x) = f(x) + 1$ and (b) $t(x) = f(x - 3)$. Describe the transformations from the graph of f to the graphs of g and t.

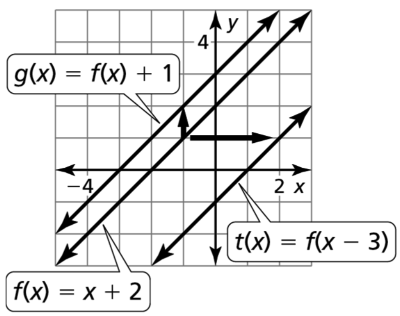
SOLUTION

a. The function g is of the form $y = f(x) + k$, where $k = 1$.

▶ The graph of g is a vertical translation 1 unit up of the graph of f.

b. The function t is of the form $y = f(x - h)$, where $h = 3$.

▶ The graph of t is a horizontal translation 3 units right of the graph of f.



Name ______________________________ Date __________

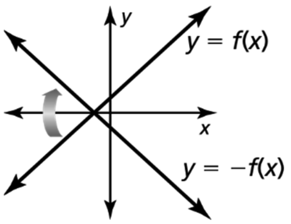
1.8 Reteach (continued)

Key Idea

A **reflection** is a transformation that flips a graph over a line called the *line of reflection*.

Reflections in the *x*-Axis

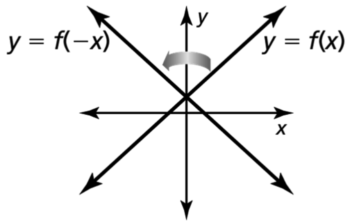
The graph of $y = -f(x)$ is a reflection in the *x*-axis of the graph of $y = f(x)$.



Multiplying the outputs by -1 changes their signs.

Reflections in the *y*-Axis

The graph of $y = f(-x)$ is a reflection in the *y*-axis of the graph of $y = f(x)$.



Multiplying the inputs by -1 changes their signs.

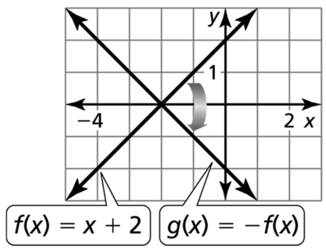
EXAMPLE Describing Reflections in the *x*-Axis and the *y*-Axis

Let $f(x) = x + 2$. Graph (a) $g(x) = -f(x)$ and (b) $t(x) = f(-x)$. Describe the transformations from the graph of f to the graphs of g and t.

SOLUTION

a. To find the outputs of g, multiply the outputs of f by –1. The graph of g consists of the points $(x, -f(x))$.

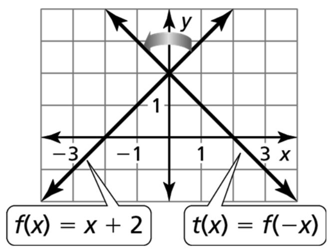
x	–3	–2	–1
***f*(*x*)**	–1	0	1
–*f*(*x*)	1	0	–1



▶ The graph of g is a reflection in the *x*-axis of the graph of f.

b. To find the outputs of t, multiply the inputs by –1 and then evaluate f. The graph of t consists of the points $(x, f(-x))$.

x	–1	0	1
–*x*	1	0	–1
***f*(–*x*)**	3	2	1



▶ The graph of t is a reflection in the *y*-axis of the graph of f.

Name______________________________ Date__________

1.8 Reteach (continued)

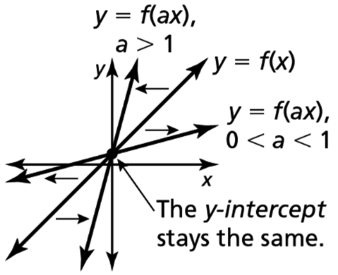
You can transform a function by multiplying all the inputs (x-coordinates) by the same factor a. When $a > 1$, the transformation is a **horizontal shrink** because the graph shrinks toward the y-axis. When $0 < a < 1$, the transformation is a **horizontal stretch** because the graph stretches away from the y-axis. In each case, the y-intercept stays the same.

You can also transform a function by multiplying all the outputs (y-coordinates) by the same factor a. When $a > 1$, the transformation is a **vertical stretch** because the graph stretches away from the x-axis. When $0 < a < 1$, the transformation is a **vertical shrink** because the graph shrinks toward the x-axis. In each case, the x-intercept stays the same.

Key Idea

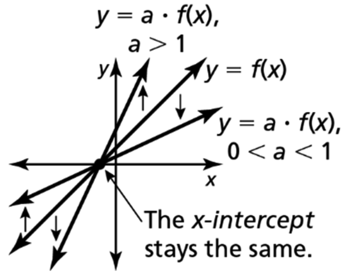
Horizontal Stretches and Shrinks

The graph of $y = f(ax)$ is a horizontal stretch or shrink by a factor of $\frac{1}{a}$ of the graph of $y = f(x)$, where $a > 0$ and $a \neq 1$.



Vertical Stretches and Shrinks

The graph of $y = a \bullet f(x)$ is a vertical stretch or shrink by a factor of a of the graph of $y = f(x)$, where $a > 0$ and $a \neq 1$.



EXAMPLE Describing Horizontal and Vertical Stretches

Let $f(x) = x + 2$. Graph (a) $g(x) = f\left(\frac{1}{2}x\right)$ and (b) $h(x) = 2f(x)$.

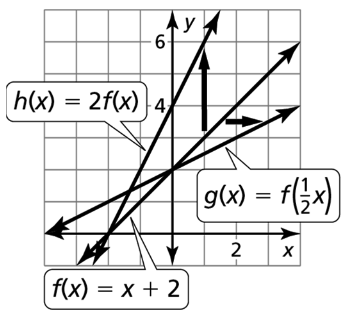
Describe the transformations from the graph of f to the graphs of g and h.

SOLUTION

a. To find the outputs of g, multiply the inputs by $\frac{1}{2}$. Then evaluate f.

The graph of g consists of the points $\left(x, f\left(\frac{1}{2}x\right)\right)$.

▶ The graph of g is a horizontal stretch of the graph of f by a factor of $1 \div \frac{1}{2} = 2$.



b. To find the outputs of h, multiply the outputs of f by 2. The graph of h consists of the points $(x, 2f(x))$.

▶ The graph is a vertical stretch of the graph of f by a factor of 2.

Name ______________________________ Date __________

1.8 Reteach (continued)

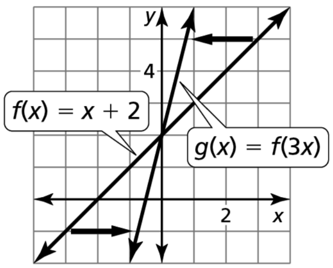
EXAMPLE Describing Horizontal and Vertical Shrinks

Let $f(x) = x + 2$. Graph (a) $g(x) = f(3x)$ and (b) $h(x) = \frac{1}{3}f(x)$.
Describe the transformations from the graph of *f* to the graphs of *g* and *h*.

SOLUTION

a. To find the outputs of *g*, multiply the inputs by 3. Then evaluate *f*. The graph of *g* consists of the points $\left(x, f(3x)\right)$.

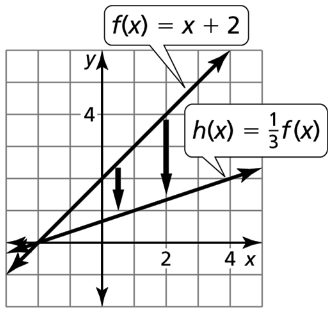
x	–1	0	1
3x	–3	0	3
f(3x)	–1	2	5



▶ The graph of *g* is a horizontal shrink of the graph of *f* by a factor of $1 \div 3 = \frac{1}{3}$.

b. To find the outputs of *h*, multiply the outputs of *f* by $\frac{1}{3}$. The graph of *h* consists of the points $\left(x, \frac{1}{3}f(x)\right)$.

x	–2	1	4
f(x)	0	3	6
$\mathbf{\frac{1}{3}f(x)}$	0	1	2



▶ The graph of *h* is a vertical shrink of the graph of *f* by a factor of $\frac{1}{3}$.

In Exercises 1–12, use the graphs of *f* and *g* to describe the transformation from the graph of *f* to the graph of *g*.

1. $f(x) = 2x + 3;\ g(x) = f(x) - 2$

2. $f(x) = 3x;\ g(x) = f(x + 1)$

3. $f(x) = -x - 4;\ g(x) = f(x) + 6$

4. $f(x) = \frac{1}{3}x;\ g(x) = f(x - 1)$

5. $f(x) = \frac{1}{2}x + 5;\ g(x) = -f(x)$

6. $f(x) = -4x + 2;\ g(x) = f(-x)$

7. $f(x) = 5x + 5;\ g(x) = f(-x)$

8. $f(x) = x - 3;\ g(x) = -f(x)$

9. $f(x) = 4x - 7;\ g(x) = f(6x)$

10. $f(x) = 3x + 6;\ g(x) = \frac{1}{6}f(x)$

11. $f(x) = 2x + 4;\ g(x) = f\left(\frac{1}{5}x\right)$

12. $f(x) = -2x + 1;\ g(x) = 2f(x)$

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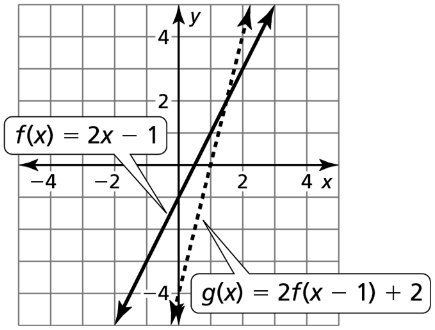
1.8 Enrichment and Extension

Multiple Transformations of Linear Equations

Example: Let $f(x) = 2x - 1$. Graph the transformation $g(x) = 2f(x - 1) + 2$. Use composition of functions to rewrite $g(x)$. Then find $g(-1)$, $g(0)$, and $g(1)$ to check your graph.



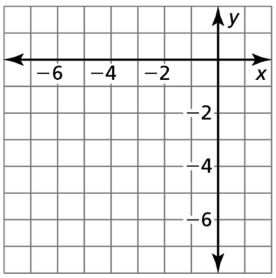
$$g(x) = 2(2(x - 1) - 1) + 2 \qquad g(-1) = -8$$

$$g(x) = 2(2x - 3) + 2 \qquad g(0) = -4$$

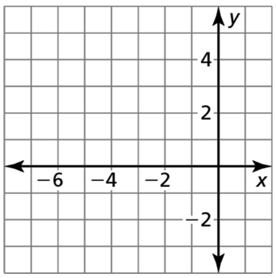
$$g(x) = 4x - 4 \qquad g(1) = 0$$

In Exercises 1–3, let $f(x) = 3x + 2$. Graph each transformation given. Use composition of functions to rewrite $g(x)$. Then find $g(-2)$, $g(0)$, and $g(1)$.

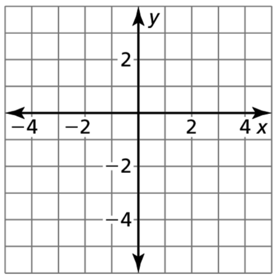
1. $g(x) = -f\left(\frac{1}{3}x\right) - 4$



2. $g(x) = \frac{1}{5}f(x + 3) + 2$



3. $g(x) = f(2x - 1) - 3$



4. What is different about Exercise 3? Is it possible to write a rule for this type of transformation? If so, please demonstrate.

Name ______________________________ Date __________

1.8 Puzzle Time

What Did One Watch Say To The Other Watch?

Write the letter of each answer in the box containing the exercise number.

Use the graph of *f* and *g* to describe the transformation from the graph of *f* to the graph of *g*.

1. $f(x) = x - 7;\ g(x) = f(x - 2)$

2. $f(x) = \frac{3}{5}x + 9;\ g(x) = f(-x)$

3. $f(x) = -6x - 11;\ g(x) = f\left(\frac{1}{4}x\right)$

4. $f(x) = \frac{2}{3}x - 18;\ g(x) = f(x) - 2$

5. $f(x) = -10x + 21;\ g(x) = 8f(x)$

6. $f(x) = x;\ g(x) = f(x) + 6$

Describe the transformations from the graph of *f* to the graph of *g*.

7. $f(x) = x;\ g(x) = -x + \frac{9}{16}$

8. $f(x) = x;\ g(x) = \frac{1}{2}x - 6$

9. $f(x) = x;\ g(x) = 4x - 3$

10. Members of the marching band need to rent a moving van to haul their instruments back and forth to several competitions. The total cost C (in dollars) to rent a moving van for m miles is represented by $C(m) = 4m + 225$, where the flat fee is $225 and the charge per mile is $4. The flat fee decreases by $5. The new total cost T is represented by $T(m) = C(m) - 5$. Describe the transformation from the graph of C to the graph of T.

Answers

G. a vertical stretch by a factor of 8

I. a reflection in the x-axis, then a vertical translation $\frac{9}{16}$ units up

A. a reflection in the y-axis

T. a horizontal stretch by a factor of 2, then a vertical translation 6 units down

N. a vertical translation 5 units down

U. a vertical translation 2 units down

E. a horizontal translation 2 units right

M. a horizontal shrink by a factor of $\frac{1}{4}$, then a vertical translation 3 units down

T. a vertical translation 6 units up

O. a horizontal stretch by a factor of 4

5	3	8		2		9	7	10	4	6	1