English Spanish

9.5 Analyzing Graphs

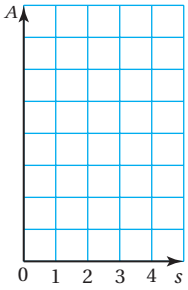
Essential Question How can you analyze a function from its graph?

1 ACTIVITY: Analyzing Graphs

Work with a partner. Copy and complete the table for the given situation. Then make a graph of the data. Write an equation for the function. Describe the characteristics of the graph.

a. Find the area of a square with side length s.

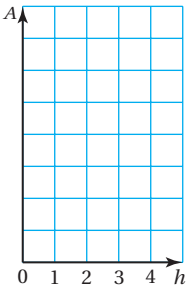
Side, s	1	2	3	4
Area, A				



Side, s

b. Find the amount earned for working h hours at \$3 per hour.

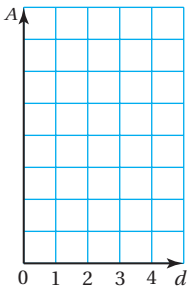
Hour, h	1	2	3	4
Amount, A				



Hour, h

c. You start with \$20 in a savings account. Find the amount left in the account when you withdraw \$2 each day d.

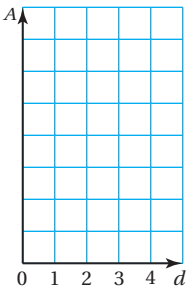
Day, d	1	2	3	4
Amount, A				



Day, d

d. You start with \$10 in a savings account. Find the amount in the account when you deposit \$2 each day d.

Day, d	1	2	3	4
Amount, A				



Day, d

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2 ACTIVITY: Conducting an Experiment

Work with a partner.

Collect Materials:

- A board at least 8 feet long
- Five books of the same thickness
- Toy car
- Stopwatch

Perform the Experiment:

- Place one book underneath one end of the board.
- Put the car at the top of the ramp. Measure the time (in seconds) it takes the car to roll down the ramp.
- Record your result in a table.
- Repeat the experiment with two, three, and four books.

Analyze the Results:

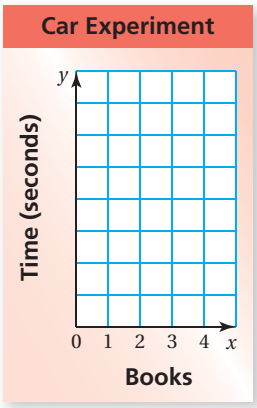
- Make a graph of your data.
- Does the graph have the characteristics of any of the graphs in Activity 1? Explain.

Use Your Results to Predict:

- Use your graph to predict how long it will take the car to roll down the ramp when five books are placed under the board.

Test Your Prediction:

- Repeat the experiment with five books. How close was your prediction?



What Is Your Answer?

3. **IN YOUR OWN WORDS** How can you analyze a function from its graph? Give a real-life example of how a graph can help you make a decision.

Practice Use what you learned about analyzing graphs to complete Exercises 3 and 4 on page 396.

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9.5 Lesson

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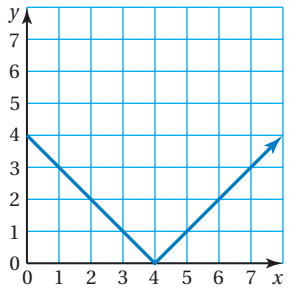
A function whose graph is a straight line is a **linear function**.

EXAMPLE 1 Identifying Linear Functions

Key Vocabulary
linear function, *p. 394*

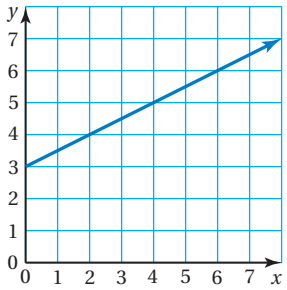
Does the graph represent a linear function? Explain.

a.



The graph is not a straight line. So, the graph does *not* represent a linear function.

b.



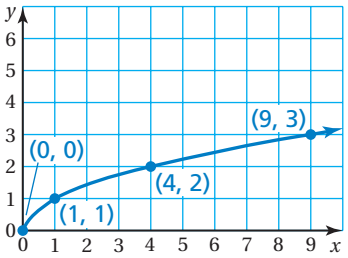
The graph is a straight line. So, the graph does represent a linear function.

EXAMPLE 2 Identifying a Linear Function

Input, x	Output, y
0	0
1	1
4	2
9	3

Does the input-output table represent a linear function? Explain.

The ordered pairs in the table are (0, 0), (1, 1), (4, 2), and (9, 3). Plot the ordered pairs and draw a graph through the points.



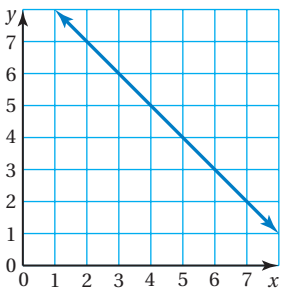
The graph is not a straight line. So, the function is *not* linear.

On Your Own

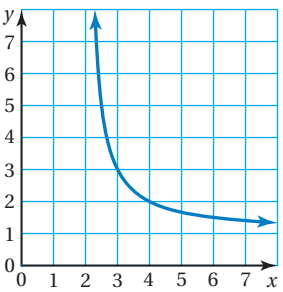
Now You're Ready
Exercises 5–14

Does the graph or table represent a linear function? Explain.

1.



2.



3.

Input, x	0	3	6	8
Output, y	1	4	7	9

4.

Input, x	0	1	2	3
Output, y	1	2	5	10

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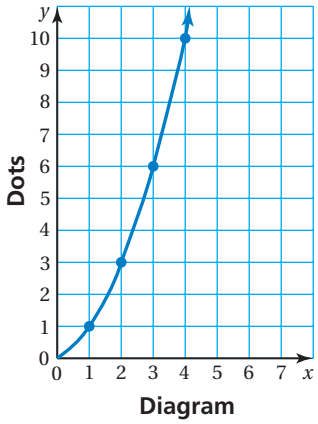
EXAMPLE 3 Identifying a Linear Function

Is the function relating the diagram number x to the number of dots y linear?

Make an input-output table. Then graph the ordered pairs and draw the graph.

Diagram, x	Dots, y	(x, y)
1	1	(1, 1)
2	3	(2, 3)
3	6	(3, 6)
4	10	(4, 10)

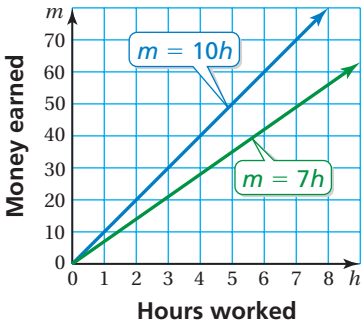


∴ The graph is not a straight line. So, the function is *not* linear.

EXAMPLE 4 Comparing Linear Functions

Your sister earns \$10 per hour. Your brother earns \$7 per hour.

The functions $m = 10h$ and $m = 7h$ show the relationship between the numbers of hours h they work and the money m they earn. Which graph is steeper? Explain.

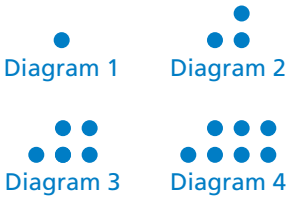


∴ The graph of $m = 10h$ is steeper. The reason it is steeper is that your sister's hourly rate is greater than your brother's hourly rate.

On Your Own

Now You're Ready
Exercises 15–19

5. Make an input-output table for the pattern. Is the function relating the diagram number x to the number of dots y linear? Explain.



6. The functions $d = 65t$ and $d = 55t$ show the relationship between the distances d (in miles) traveled and the times t (in hours) for two cars. Graph the functions. Which graph is steeper? Explain.

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9.5 Exercises

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Vocabulary and Concept Check

1. **VOCABULARY** Why are some functions called *linear functions*?
2. **WRITING** How can you decide whether or not an input-output table represents a linear function?

Practice and Problem Solving

Copy and complete the table. Then make a graph of the data. Write an equation for the function.

3. Find the diameter of a circle with radius r.

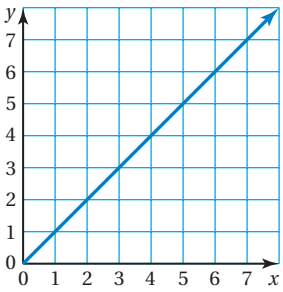
Radius, r	1	2	3	4
Diameter, d				

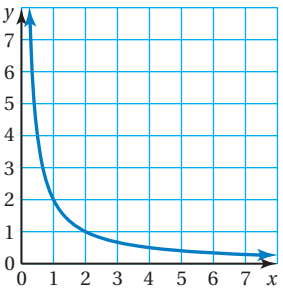
4. Find the cost of renting roller blades for h hours at \$6 per hour.

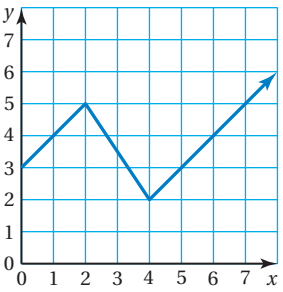
Hours, h	1	2	3	4
Cost, c				

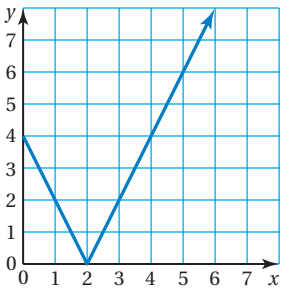
Does the graph represent a linear function? Explain.

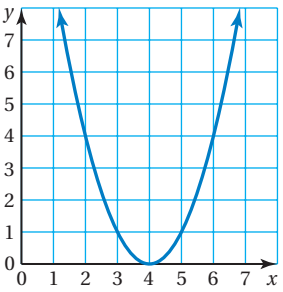
1

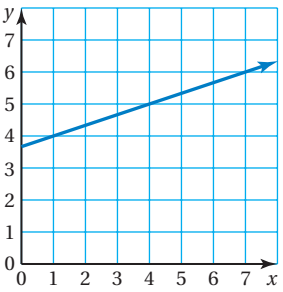
5. 

6. 

7. 

8. 

9. 

10. 

Does the input-output table represent a linear function? Explain.

2

11.

Input, x	1	2	3	4
Output, y	1	3	5	7

12.

Input, x	0	2	4	6
Output, y	10	9	8	7

13.

Input, x	1	4	7	10
Output, y	5	2	2	5

14.

Input, x	3	4	5	6
Output, y	5	8	9	8

English Spanish

Graph each linear function. Which graph is steeper? Explain.

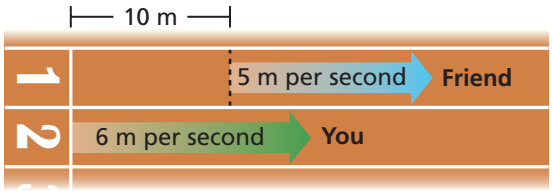
4 **15.** $y = 5x$ and $y = \frac{1}{5}x$ **16.** $y = \frac{4}{5}x$ and $y = \frac{3}{5}x$ **17.** $y = x$ and $y = 2x + 1$

Make an input-output table for the pattern. Is the function relating the figure number x to the area y linear? Explain.

3 **18.**

19.

20. FOOTRACE In a 100-meter race, you give your friend a head start. Your speeds are shown.



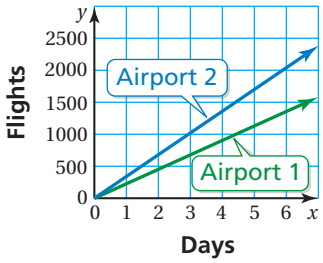
a. Write a function that represents your distance d after t seconds.

b. Write a function that represents your friend's distance d after t seconds.

c. Graph your distance and your friend's distance in the same coordinate plane.

d. What does the intersection of the two graphs represent?

21. AIRPORT USE The graph shows the numbers of flights that arrive at and depart from two regional airports. Which airport has more flights in a day? How many more? Explain.

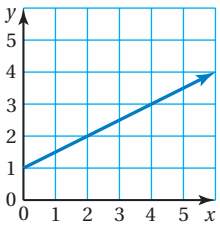


22. Reasoning Use the graph.

a. Copy and complete the table. Then find the differences.

x	0	1	2	3	4	5
y	1	1.5	2	2.5		

Differences: 0.5 0.5 ? ? ?



b. Graph other lines and find the "differences." Describe a property suggested by your results.

Fair Game Review What you learned in previous grades & lessons

Tell which number is greater. SECTION 4.3

23. 40%, $\frac{11}{25}$ **24.** 0.27, 2.8% **25.** $\frac{4}{5}$, 0.802 **26.** $\frac{33}{50}$, $66\frac{2}{3}\%$

27. MULTIPLE CHOICE For which inequality is $x = 7$ a solution? SECTION 8.1

(A) $x < 7$ (B) $x + 4 \geq 12$ (C) $21 \leq 3x$ (D) $4x - 5 > 23$