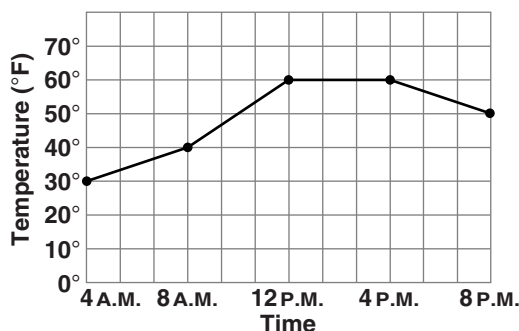


Reteaching 3-1

Relating Graphs to Events

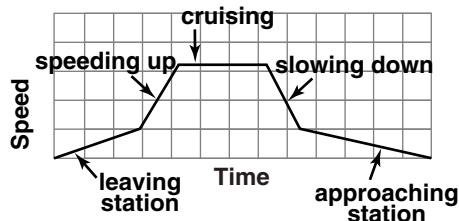
The graph at the right shows the outside temperature during 16 hours of one day.

- You can see how the temperature changed throughout the day. *The temperature rose 10°F from 4 A.M. to 8 A.M. The temperature remained at 60°F for 4 hours, from 12 P.M. to 4 P.M.*



The graph at the right shows a train moving between stations. *The train moves slowly while leaving the station. Then it picks up speed until it reaches a cruising speed. It slows down as it approaches the next station and gradually comes to a stop.*

- Since the graph is *sketched* to show relationships, the axes do not need number scales. But the axes and the parts of the graph should have labels to show what they represent.



The graph at the right shows the altitude of an airplane during a flight. Use the graph for Exercises 1–3.

- What was the airplane's altitude for most of the flight?

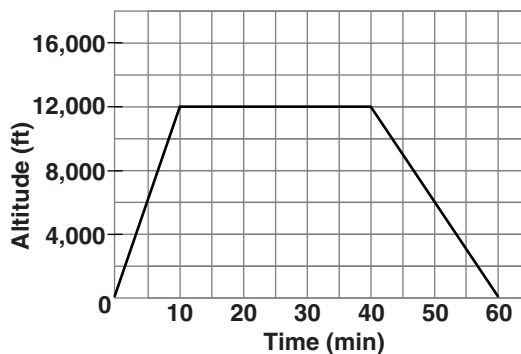
12,000 ft

- How long did it take the airplane to reach an altitude of 12,000 ft?

10 min

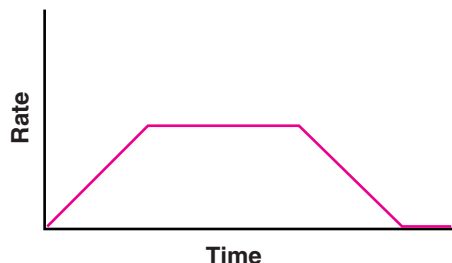
- The third segment in the graph is not as steep as the first segment. What does this mean?

The airplane ascends faster than it descends.



Sketch and label a graph of the relationship.

- You enter the freeway in your car, steadily accelerating until you are on the freeway. Then you turn the cruise control on and drive at a constant speed. When you reach your exit, you slow down as you exit the freeway until you stop at the stoplight.



Reteaching 3-3

Proportional Relationships

A proportional relationship is a relationship between inputs and outputs in which the ratio of inputs and outputs is always the same.

Gallons of Gas	Cost (\$)
1	3
2	6
3	9
4	12

$1/3$

$2/6 = 1/3$

$3/9 = 1/3$

$4/12 = 1/3$



Write the ratio of each input to its corresponding output.

Then simplify.

The ratios are all the same, so the relationship is proportional.

Determine if the relationship is proportional.

1.

x	y
-3	-9
-1	-3
2	6
4	12

Yes

2.

m	n
6	8
15	20
24	32
36	48

Yes

3.

a	b
-20	-5
-12	-3
-6	-2
2	1

No

4.

s	t
80	20
160	40
200	50
240	80

No

5. A pet store sells 2 dog biscuits for \$3 and 5 dog biscuits for \$5. Is the relationship between the price of selling 2 dog biscuits and 5 dog biscuits proportional? Explain.

No. The ratio of 2 to 3 is not the same as the ratio of 3 to 5.

Reteaching 3-4

Linear Functions

A function is linear if the relationship between the changes in variables is constant.

x	1	2	3	5
y	3	6	9	15

$\overset{+1}{\curvearrowright}$ $\overset{+1}{\curvearrowright}$ $\overset{+2}{\curvearrowright}$
 $\underset{+3}{\curvearrowleft}$ $\underset{+3}{\curvearrowleft}$ $\underset{+6}{\curvearrowleft}$

$\frac{1}{3}$ $\frac{1}{3}$ $\frac{2}{6} = \frac{1}{3}$

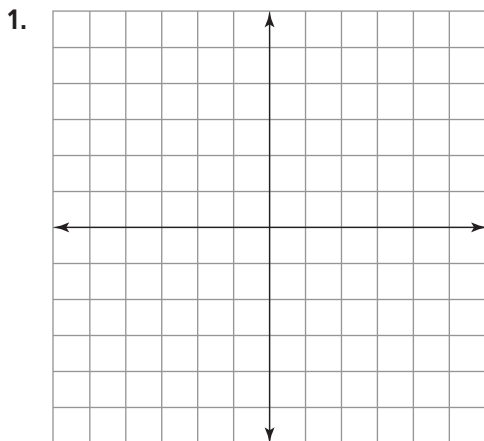
A function is not linear if the relationship between the changes in variables is not constant.

x	2	4	6	8
y	4	6	10	16

$\overset{+2}{\curvearrowright}$ $\overset{+2}{\curvearrowright}$ $\overset{+2}{\curvearrowright}$
 $\underset{+2}{\curvearrowleft}$ $\underset{+4}{\curvearrowleft}$ $\underset{+6}{\curvearrowleft}$

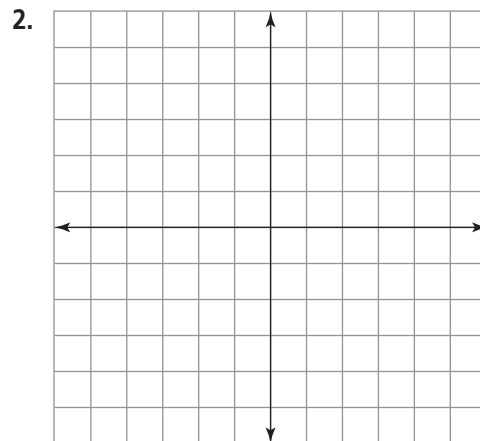
$\frac{2}{2} = 1$ $\frac{2}{4} = \frac{1}{2}$ $\frac{2}{6} = \frac{1}{3}$

Graph each function. Determine if the function represented in the table is linear.



x	-4	-2	1	5
y	-2	0	3	7

linear

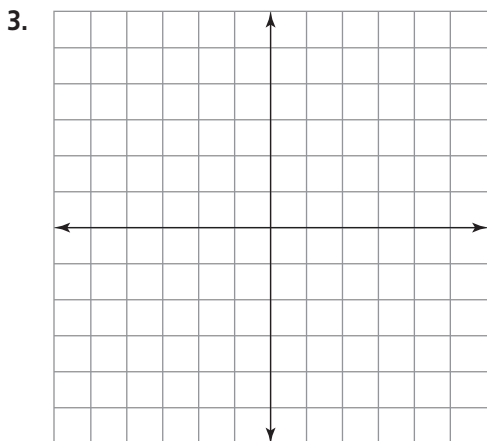


x	-2	-1	1	2
y	7	4	4	7

nonlinear

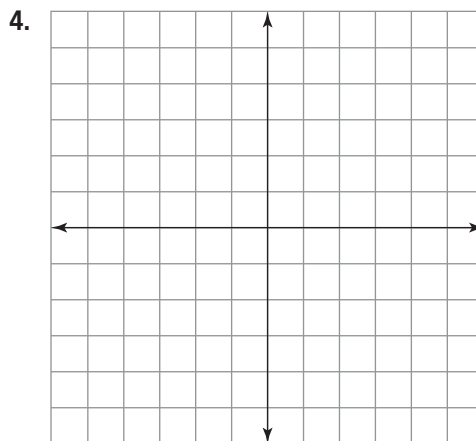
Reteaching 3-4 (continued)

Linear Functions



x	-2	-1	2	4
y	-5	-3	3	7

linear



x	-1	1	3	5
y	1	4	7	10

nonlinear

Check students' graphs.

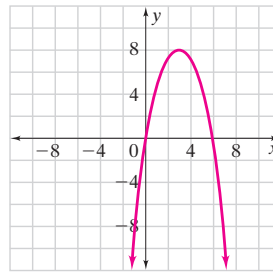
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Reteaching 3-5

Nonlinear Functions

The graphs of nonlinear functions are not straight lines. A quadratic function is nonlinear. Its graph is a parabola.



One way to tell if a function is nonlinear is by looking at the function's greatest exponent. If it is 2 or greater, the function is nonlinear.

$y = x + 3$ ← linear

$y = x^2 + 5$ ← nonlinear

$y = 2x^3 - 1$ ← nonlinear

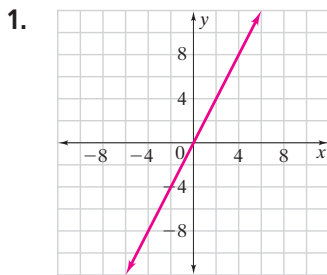
Another way to tell if a function is nonlinear is by using a table. If the ratios between the changes in variables in a table are *not* the same, then the function is nonlinear.

x	1	2	3	4
y	1	7	17	31

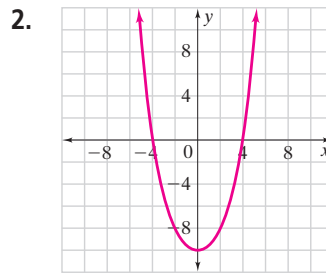
$\overset{+1}{\curvearrowright}$ $\overset{+1}{\curvearrowright}$ $\overset{+1}{\curvearrowright}$
 $\underset{+6}{\curvearrowright}$ $\underset{+10}{\curvearrowright}$ $\underset{+14}{\curvearrowright}$

The ratios $\frac{1}{6}$, $\frac{1}{10}$, and $\frac{1}{14}$ are not the same. The table represents a nonlinear function.

Identify each function as linear or nonlinear.



linear



nonlinear

3. $y = 3x$

linear

4. $y = x^3 + 2x - 1$

nonlinear

5.

x	2	4	6	8
y	6	18	38	66

nonlinear

6.

x	1	2	3	4
y	-1	0	1	2

linear

7. Write a description of a situation that can be represented by a nonlinear function.

Check students' answers.