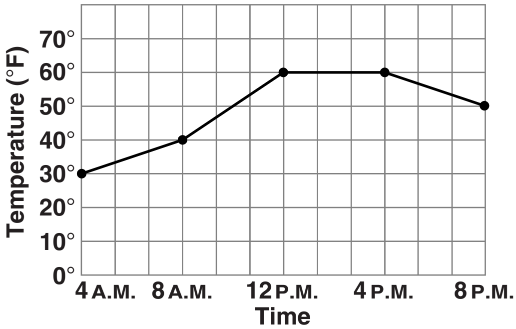
Name ______________________ Class ______________ Date ____________

# Reteaching 3-1

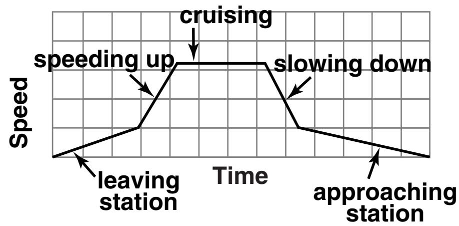
## Relating Graphs to Events

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.

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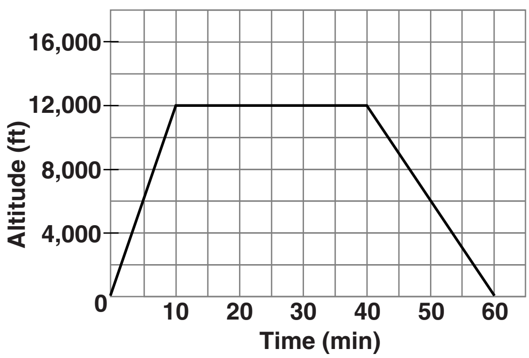
**The graph at the right shows the altitude of an airplane during a flight. Use the graph for Exercises 1–3.**




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

   ______________________________

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

   ______________________________

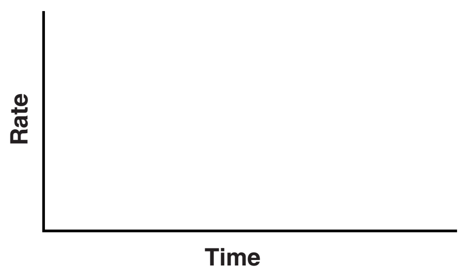
3. The third segment in the graph is not as steep as the first segment. What does this mean?

   ______________________________

   ______________________________

**Sketch and label a graph of the relationship.**

4. 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.



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# Reteaching 3-2

**Functions**

A *function* describes the relationship between two variables called the *input* and the *output.* In a function, each input value has only one output value.

Function:

$$y = 2x + 4$$

↑ output variable $y$ ↑ input variable $x$

You can list input/output pairs in a table.

$y = 2x + 4$

| Input $x$ | Output $y$ |
|---|---|
| −10 | −16 |
| −5 | −6 |
| 0 | 4 |
| 1 | 6 |

To find output $y$, substitute values for input $x$ into the function equation.

For $x = -10$: $y = 2(-10) + 4$

$y = -16$

You can also show input/output pairs using *function rules.*

Function rule:

$y = 2x + 4$

$y = 2(-10) + 4 = -16$

↑ *input* ↑ *output*

Find $y$ when $x = 0$.

$y = 2(0) + 4$

$y = 4$

---

**Complete the table of input/output pairs for each function.**

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

| Input $x$ | Output $y$ |
|---|---|
| 5 | |
| 7 | |
| 9 | |
| 11 | |

**2.** $d = 20r$

| Input $r$ | Output $d$ |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| | 160 |

**3.** $y = 25 - 2x$

| Input $x$ | Output $y$ |
|---|---|
| 0 | |
| 1 | |
| | 21 |
| | 19 |

**Use the function rule $y = 3x + 1$. Find each output.**

**4.** $y$ when $x = 0$.

= 3(______) + 1

= ______________

**5.** $y$ when $x = 1$.

= 3(______) + 1

= ______________

**6.** $y$ when $x = 5$.

______________

**7.** $y$ when $x = -6$.

______________

Name ______________________ Class ______________ Date ______________

# 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 |

______________

**2.**

| *m* | *n* |
|---|---|
| 6 | 8 |
| 15 | 20 |
| 24 | 32 |
| 36 | 48 |

______________

**3.**

| *a* | *b* |
|---|---|
| −20 | −5 |
| −12 | −3 |
| −6 | −2 |
| 2 | 1 |

______________

**4.**

| *s* | *t* |
|---|---|
| 80 | 20 |
| 160 | 40 |
| 200 | 50 |
| 240 | 80 |

______________

**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.

______________________________________________

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# Reteaching 3-4

**Linear Functions**

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

| | +1 | +1 | +2 | |
|---|---|---|---|---|
| ***x*** | 1 | 2 | 3 | 5 |
| ***y*** | 3 | 6 | 9 | 15 |
| | +3 | +3 | +6 | |

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

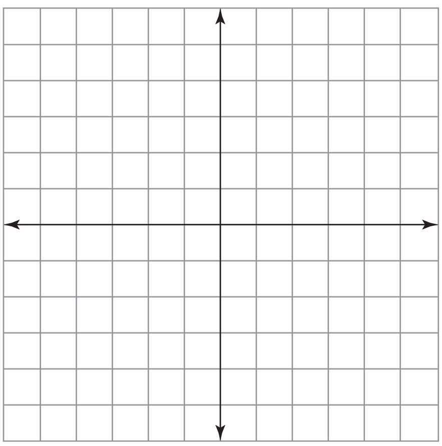
A function is not linear if the relationship between the changes in variables is not constant.

| | +2 | +2 | +2 | |
|---|---|---|---|---|
| ***x*** | 2 | 4 | 6 | 8 |
| ***y*** | 4 | 6 | 10 | 16 |
| | +2 | +4 | +6 | |

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

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

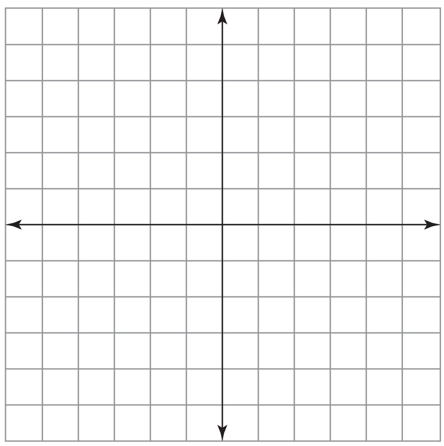
**1.**



| ***x*** | −4 | −2 | 1 | 5 |
|---|---|---|---|---|
| ***y*** | −2 | 0 | 3 | 7 |

______________________

**2.**



| ***x*** | −2 | −1 | 1 | 2 |
|---|---|---|---|---|
| ***y*** | 7 | 4 | 4 | 7 |

______________________

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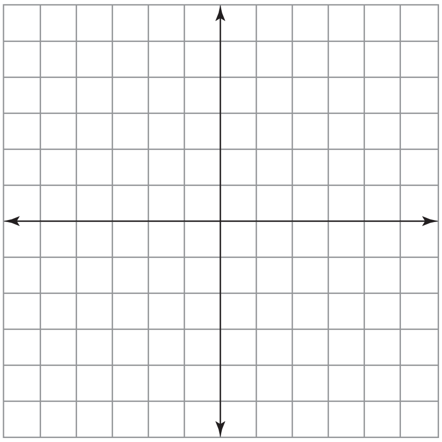
# Reteaching 3-4 (continued)

**Linear Functions**

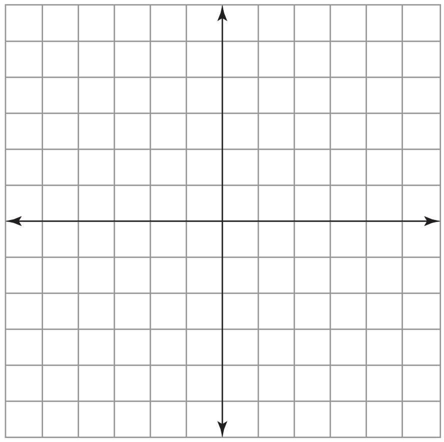
**3.**



| *x* | −2 | −1 | 2 | 4 |
|---|---|---|---|---|
| *y* | −5 | −3 | 3 | 7 |

____________________

**4.**



| *x* | −1 | 1 | 3 | 5 |
|---|---|---|---|---|
| *y* | 1 | 4 | 7 | 10 |

____________________

________________________________________

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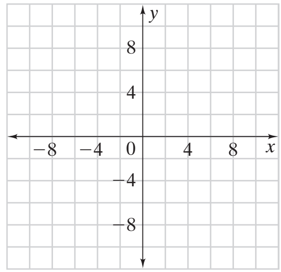
# Reteaching 3-5

**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 functions greatest exponent. If it is 2 or greater, the function in 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.

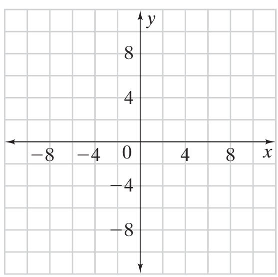
| **x** | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| **y** | 1 | 7 | 17 | 31 |

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

---

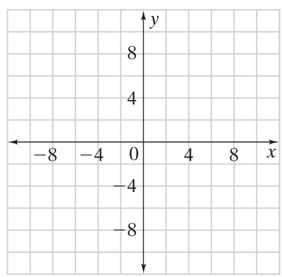
Identify each function as linear or nonlinear.

**1.**




______________________

**2.**




______________________

**3.** $y = 3x$

______________________

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

______________________

**5.**

| **x** | 2 | 4 | 6 | 8 |
|---|---|---|---|---|
| **y** | 6 | 18 | 38 | 66 |

______________________

**6.**

| **x** | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| **y** | −1 | 0 | 1 | 2 |

______________________

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

______________________________________________