Vocabulary

Review

1. Cross out the item(s) that are NOT *vertical*.

| the *y*-axis | the *x*-axis | the horizon | columns | rows |

Vocabulary Builder

translation (noun) **trans LAY shun**

Other Word Forms: translate (verb), translatable (adjective), translation (noun)

Definition: A **translation** is a change from one form, state, or appearance to another.

Math Usage: A **translation** shifts the graph of a parent function horizontally, vertically, or both without changing its size or shape.

Use Your Vocabulary

2. Complete each statement with the correct form of the word *translation*.

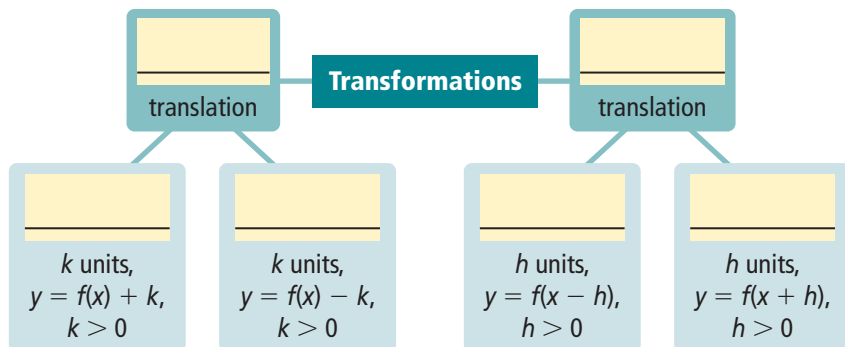NOUN The graph shows a vertical ___?___ of the function.

ADJECTIVE The toddler's language was not ___?___ .

VERB The Spanish teacher helped the town mayor ___?___ the letter.

3. Complete the graphic organizer below.

| | **Transformations** | |
| translation | | translation |

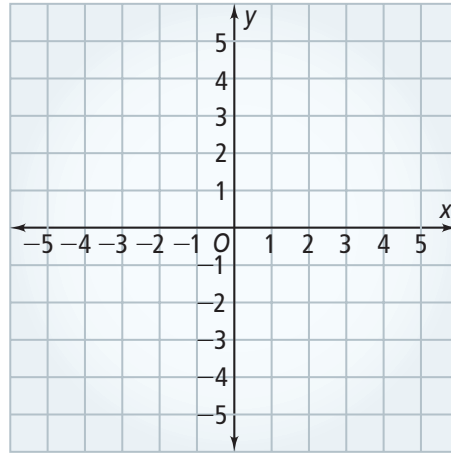| | | | |
| *k* units, $y = f(x) + k$, $k > 0$ | *k* units, $y = f(x) - k$, $k > 0$ | *h* units, $y = f(x - h)$, $h > 0$ | *h* units, $y = f(x + h)$, $h > 0$ |

Problem 1   Vertical Translation

Got It? How are the functions $y = 2x$ and $y = 2x - 3$ related? How are their graphs related?

4. Complete the table of values.

x	y = 2x	y = 2x − 3
−2		
−1		
0		
1		
2		

5. Draw the graphs on the coordinate plane below.
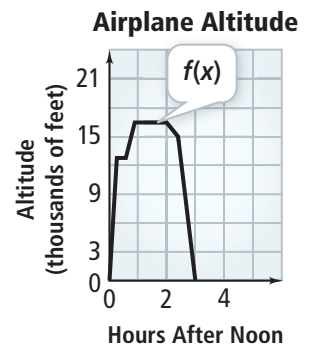
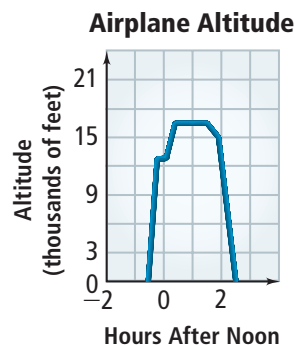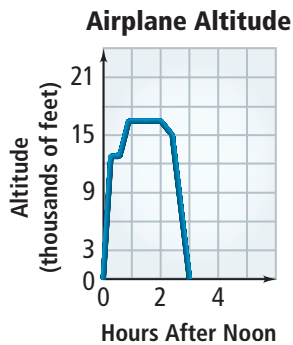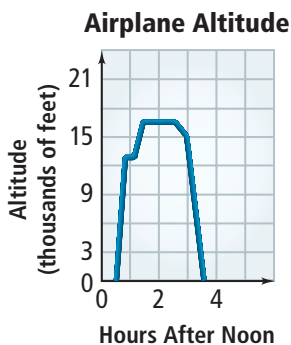**6.** Write T for *true* or F for *false*.

_____ Each output value for $y = 2x - 3$ is three less than the corresponding output value for $y = 2x$.

_____ The graph of $y = 2x - 3$ is the graph of $y = 2x$ stretched vertically two units.

_____ The graph of $y = 2x - 3$ is the graph of $y = 2x$ translated down three units.

_____ The graphs of $y = 2x - 3$ and $y = 2x$ are parallel.

Problem 2   Horizontal Translation

Got It? The graph shows the projected altitude $f(x)$ of an airplane scheduled to depart an airport at noon. If the plane leaves 30 minutes early, what function represents this transformation?

Airplane Altitude

$f(x)$

Altitude (thousands of feet)

Hours After Noon

7. Circle the graph below that shows the plane leaving 30 minutes early.

Airplane Altitude

Altitude (thousands of feet)

Hours After Noon

Airplane Altitude

Altitude (thousands of feet)

Hours After Noon

Airplane Altitude

Altitude (thousands of feet)

Hours After Noon

8. Circle the function that represents this transformation.

$f(x + 30)$ $f(x - 30)$ $f\left(x + \frac{1}{2}\right)$ $f\left(x - \frac{1}{2}\right)$
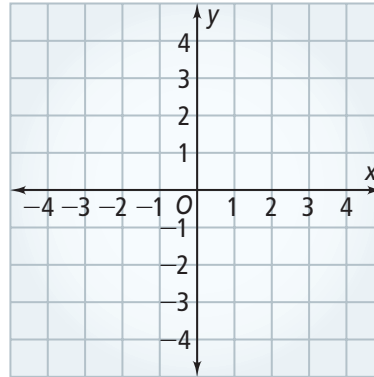
Problem 3   Reflecting a Function Algebraically

Got It? Let $h(x)$ be the reflection of $f(x) = 3x + 3$ in the x-axis. What is a function rule for $h(x)$?

9. Circle the function that shows $f(x)$ reflected in the x-axis.

$f(-x)$ $-f(x)$

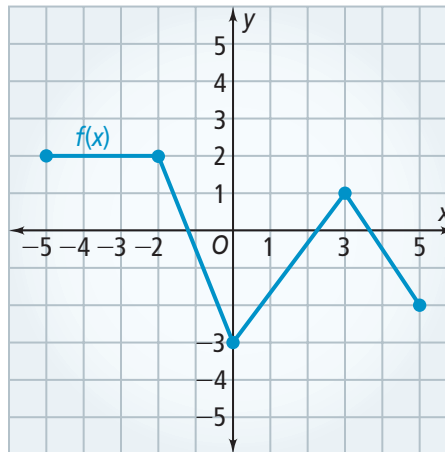**10.** Write the function rule for $h(x)$ below. Then graph $h(x)$ and $f(x)$ to check the reflection.

Problem 4   Stretch and Compression

Got It? For the function $f(x)$ in the table below, what are the corresponding table and graph for the transformation $h(x) = \frac{1}{3}f(x)$?

11. Complete the table of output values.

x	$f(x)$	$h(x)$
-5	2	$\frac{2}{3}$
-2	2	
0	-3	
3	1	
5	-2	

12. Graph $h(x)$ on the coordinate plane below.

Got It? The function $f(x) = x$. The graph of $g(x)$ is $f(x)$ stretched vertically by a factor of 2 and translated down 3 units. What is the function rule for $g(x)$?

13. Underline the correct word or expression to complete each sentence.

The function $f(x) = x$ stretched vertically by a factor of 2 is
$x + 2 \; / \; x - 2 \; / \; 2x \; / \; -2x$.

The function $f(x) = x$ stretched vertically by a factor of 2 and then translated down 3 units is $-2x + 3 \; / \; 2x - 3 \; / \; -2x - 3 \; / \; 2x + 3$.
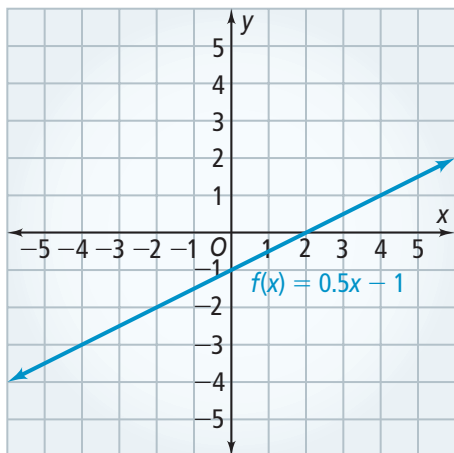
14. The function rule for the combined transformation is

Lesson Check • Do you UNDERSTAND?

Compare and Contrast The graph below shows $f(x) = 0.5x - 1$. Graph $g(x)$ by translating $f(x)$ up 2 units and then stretching it vertically by a factor of 2. Graph $h(x)$ by stretching $f(x)$ by a factor of 2 and then translating it up 2 units. Compare the graphs of $g(x)$ and $h(x)$.

15. Graph $g(x)$ and $h(x)$.

$f(x) = 0.5x - 1$

16. Underline the correct word(s) or expression to complete each sentence or equation.

$g(x)$ and $h(x)$ are / are not the same function.

$g(x) = \; x + 2 \; / \; x - 2 \; / \; x \; / \; -x$

$h(x) = \; x + 2 \; / \; x - 2 \; / \; x \; / \; -x$

$g(x)$ and $h(x)$ are

the same / parallel / perpendicular lines.
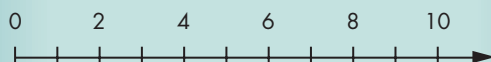

Math Success

Check off the vocabulary words that you understand.

☐ translation   ☐ reflection   ☐ transformation   ☐ stretch   ☐ compression

Rate how well you can *transform linear functions.*

Need to review   0   2   4   6   8   10   Now I get it!