

**Chapter 1**  
**Linear Functions**

**Section 1-2**  
**Transformations of Linear and Absolute Value Functions**

**EXAMPLE 1** Writing Translations of Functions

Let  $f(x) = 2x + 1$ .

- a. Write a function  $g$  whose graph is a translation 3 units down of the graph of  $f$ .
- b. Write a function  $h$  whose graph is a translation 2 units to the left of the graph of  $f$ .

**EXAMPLE 2** Writing Reflections of Functions

Let  $f(x) = |x + 3| + 1$ .

- a. Write a function  $g$  whose graph is a reflection in the  $x$ -axis of the graph of  $f$ .
- b. Write a function  $h$  whose graph is a reflection in the  $y$ -axis of the graph of  $f$ .

Write a function  $g$  whose graph represents the indicated transformation of the graph of  $f$ . Use a graphing calculator to check your answer.

- ▶ 1.  $f(x) = 3x$ ; translation 5 units up
- ▶ 2.  $f(x) = |x| - 3$ ; translation 4 units to the right
- ▶ 3.  $f(x) = -|x + 2| - 1$ ; reflection in the  $x$ -axis
- ▶ 4.  $f(x) = \frac{1}{2}x + 1$ ; reflection in the  $y$ -axis

**EXAMPLE 3** Writing Stretches and Shrinks of Functions

Let  $f(x) = |x - 3| - 5$ . Write (a) a function  $g$  whose graph is a horizontal shrink of the graph of  $f$  by a factor of  $\frac{1}{3}$ , and (b) a function  $h$  whose graph is a vertical stretch of the graph of  $f$  by a factor of 2.

**Write a function  $g$  whose graph represents the indicated transformation of the graph of  $f$ . Use a graphing calculator to check your answer.**

- ▶ 5.  $f(x) = 4x + 2$ ; horizontal stretch by a factor of 2
- ▶ 6.  $f(x) = |x| - 3$ ; vertical shrink by a factor of  $\frac{1}{3}$

### EXAMPLE 4 Combining Transformations

Let the graph of  $g$  be a vertical shrink by a factor of 0.25 followed by a translation 3 units up of the graph of  $f(x) = x$ . Write a rule for  $g$ .

7. Let the graph of  $g$  be a translation 6 units down followed by a reflection in the  $x$ -axis of the graph of  $f(x) = |x|$ . Write a rule for  $g$ . Use a graphing calculator to check your answer.