

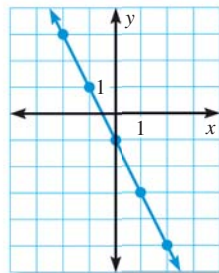
### EXAMPLE 4 Graph an equation in two variables

Graph the equation  $y = -2x - 1$ .

#### Solution

**STEP 1** Construct a table of values.

$x$	-2	-1	0	1	2
$y$	3	1	-1	-3	-5



**STEP 2** Plot the points. Notice that they all lie on a line.

**STEP 3** Connect the points with a line.

**LINEAR FUNCTIONS** The function  $y = -2x - 1$  in Example 4 is a **linear function** because it can be written in the form  $y = mx + b$  where  $m$  and  $b$  are constants.

The graph of a linear function is a line. By renaming  $y$  as  $f(x)$ , you can write  $y = mx + b$  using **function notation**.

$$y = mx + b \quad \text{Linear function in } x\text{-}y \text{ notation}$$

$$f(x) = mx + b \quad \text{Linear function in function notation}$$

The notation  $f(x)$  is read “the value of  $f$  at  $x$ ,” or simply “ $f$  of  $x$ ,” and identifies  $x$  as the independent variable. The domain consists of all values of  $x$  for which  $f(x)$  is defined. The range consists of all values of  $f(x)$  where  $x$  is in the domain of  $f$ .

#### READING

The parentheses in  $f(x)$  do not indicate multiplication. The symbol  $f(x)$  does not mean “ $f$  times  $x$ .”

### EXAMPLE 5 Classify and evaluate functions

Tell whether the function is linear. Then evaluate the function when  $x = -4$ .

a.  $f(x) = -x^2 - 2x + 7$

b.  $g(x) = 5x + 8$

#### Solution

a. The function  $f$  is not linear because it has an  $x^2$ -term.

$$f(x) = -x^2 - 2x + 7 \quad \text{Write function.}$$

$$f(-4) = -(-4)^2 - 2(-4) + 7 \quad \text{Substitute } -4 \text{ for } x.$$

$$= -1 \quad \text{Simplify.}$$

b. The function  $g$  is linear because it has the form  $g(x) = mx + b$ .

$$g(x) = 5x + 8 \quad \text{Write function.}$$

$$g(-4) = 5(-4) + 8 \quad \text{Substitute } -4 \text{ for } x.$$

$$= -12 \quad \text{Simplify.}$$

#### REPRESENT FUNCTIONS

Letters other than  $f$ , such as  $g$  or  $h$ , can also name functions.

#### GUIDED PRACTICE for Examples 4 and 5

4. Graph the equation  $y = 3x - 2$ .

Tell whether the function is linear. Then evaluate the function when  $x = -2$ .

5.  $f(x) = x - 1 - x^3$

6.  $g(x) = -4 - 2x$