

## 5.2 Use Linear Equations in Slope-Intercept Form $y = mx + b$

Goal • Write an equation of a line using points on the line.

### WRITING AN EQUATION OF A LINE IN SLOPE-INTERCEPT FORM

Step 1 Identify the slope  $m$ . You can use the slope formula to calculate the slope if you know two points on the line.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Step 2 Find the y-intercept. You can substitute the slope and the x- and y-coordinates of a point  $(x, y)$  on the line into  $y = mx + b$ . Then solve for  $b$ .

Step 3 Write an equation using  $y = mx + b$ .

Example 1 - *Write an equation given the slope and a point.*

Write an equation of the line that passes through the point  $(1, 2)$  and has a slope of 3.

Step 1 Identify the slope. The slope is

$$\boxed{3 = m}$$

Step 2 Find the y-intercept. Substitute the slope and the coordinates of the given point into  $y = mx + b$ .

Be careful not to mix up the x- and y-values when you substitute.

$$\begin{aligned} y &= mx + b \\ 2 &= 3(1) + b \\ 2 &= 3 + b \\ -3 & \quad -3 \end{aligned}$$

$$\boxed{-1 = b}$$

Step 3 Write an equation of the line.

$$\begin{aligned} y &= 3x + -1 & y &= 3x + (-1) \\ y &= 3x - 1 \end{aligned}$$

**Checkpoint** Complete the following exercise.

1. Write an equation of the line that passes through the point (2, 2) and has a slope of 4.  $m$

$$\begin{aligned}y &= mx + b \\2 &= 4(2) + b \\2 &= 8 + b \\-8 & \quad -8 \\-6 &= b\end{aligned}$$

$$y = 4x + -6$$

$$y = 4x - 6$$

**Example 2 - Write an equation given two points**

Write an equation of the line that passes through (2, -3) and (-2, 1).

$x_1, y_1$        $x_2, y_2$

Step 1 Calculate the slope.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - (-3)}{-2 - 2} = \frac{4}{-4} = -1 = \frac{-1}{1}$$

$-1 = m$

Step 2 Find the y-intercept. Use the slope and the point (2, -3).

$$\begin{aligned}y &= mx + b \\-3 &= (-1)(2) + b \\-3 &= -2 + b \\+2 & \quad +2 \\-1 &= b\end{aligned}$$

Step 3 Write an equation of the line.

$$y = -1x + -1$$

$$y = -1x - 1$$

$$y = -x - 1$$

Checkpoint Complete the following exercise.

2. Write an equation for the line that passes through  $(-8, -13)$  and  $(4, 2)$ .

$$m = \frac{2 - (-13)}{4 - (-8)} = \frac{15}{12} \div 3 = \frac{5}{4} = m$$

$$y = \frac{5}{4}x - 3$$

$$y = \frac{5}{4}x + -3$$

$x_1, y_1$   $x_2, y_2$

$$y = mx + b$$

$$2 = \frac{5}{4} \cdot (4) + b$$

$$-2 = 5 + b$$

$$\underline{-3 = b}$$

3. Write an equation for the line that passes through  $(-3, 4)$  and  $(1, -2)$ .

### ★ HOW TO WRITE EQUATIONS IN SLOPE-INTERCEPT FORM

1. Given slope  $m$  and  $y$ -intercept  $b$ .

Substitute  $m$  and  $b$  in the equation  $y = mx + b$ .  
slope      y-int.

2. Given slope  $m$  and one point.

Substitute  $m$  and the coordinates of the point in  $y = mx + b$ .

Solve for  $b$ . Write the equation.

3. Given two points.

Use the points to find the slope  $m$ . Then substitute  $m$  and the coordinates of 1 point in  $y = mx + b$ . Solve for  $b$ .

Write the equation

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