

# Writing Linear Equations

Given a point on a line and the slope of the line, you can write an equation of the line.

**Example 1** Write an equation in slope-intercept form of the line that passes through the point  $(-5, 6)$  and has a slope of  $\frac{3}{5}$ .

$$y = mx + b \quad \text{Write the slope-intercept form.}$$

$$6 = \frac{3}{5}(-5) + b \quad \text{Substitute } \frac{3}{5} \text{ for } m, -5 \text{ for } x, \text{ and } 6 \text{ for } y.$$

$$6 = -3 + b \quad \text{Simplify.}$$

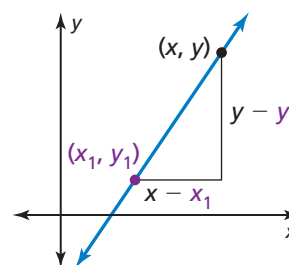
$$9 = b \quad \text{Solve for } b.$$

► So, the equation is  $y = \frac{3}{5}x + 9$ .

A linear equation written in the form  $y - y_1 = m(x - x_1)$  is in **point-slope form**. The line passes through the point  $(x_1, y_1)$ , and the slope of the line is  $m$ .

$$y - y_1 = m(x - x_1)$$

slope  
↓  
↑  
passes through  $(x_1, y_1)$



**Example 2** Write an equation in point-slope form of the line that passes through the point  $(-8, 3)$  and has a slope of  $\frac{3}{4}$ .

$$y - y_1 = m(x - x_1) \quad \text{Write the point-slope form.}$$

$$y - 3 = \frac{3}{4}[x - (-8)] \quad \text{Substitute } \frac{3}{4} \text{ for } m, -8 \text{ for } x_1, \text{ and } 3 \text{ for } y_1.$$

$$y - 3 = \frac{3}{4}(x + 8) \quad \text{Simplify.}$$

► So, the equation is  $y - 3 = \frac{3}{4}(x + 8)$ .

## Practice

Check your answers at [BigIdeasMath.com](http://BigIdeasMath.com).

Write an equation in slope-intercept form of the line that passes through the given point and has the given slope.

- $(1, 3); m = 2$      $y = 2x + 1$
- $(4, 2); m = 3$      $y = 3x - 10$
- $(-2, 3); m = \frac{1}{2}$      $y = \frac{1}{2}x + 4$
- $(6, -5); m = \frac{2}{3}$      $y = \frac{2}{3}x - 9$
- $(4, -2); m = -\frac{1}{4}$      $y = -\frac{1}{4}x - 1$
- $(-7, -3); m = -\frac{2}{7}$      $y = -\frac{2}{7}x - 5$

Write an equation in point-slope form of the line that passes through the given point and has the given slope.

- $(1, 1); m = 5$   
 $y - 1 = 5(x - 1)$
- $(-3, 4); m = 2$   
 $y - 4 = 2(x + 3)$
- $(6, -3); m = \frac{3}{2}$   
 $y + 3 = \frac{3}{2}(x - 6)$
- $(5, 7); m = \frac{2}{5}$   
 $y - 7 = \frac{2}{5}(x - 5)$
- $(-4, 5); m = -\frac{3}{4}$   
 $y - 5 = -\frac{3}{4}(x + 4)$
- $(-2, -3); m = -\frac{3}{8}$   
 $y + 3 = -\frac{3}{8}(x + 2)$