

**6.5** Slope-Point Form of the equation for a Linear Function

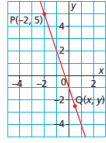
# Lesson 6

Apr 28-9:46 AM

**Connect**

When we know the slope of a line and the coordinates of a point on the line, we use the property that the slope of a line is constant to determine an equation for the line.

This line has slope  $-3$  and passes through  $P(-2, 5)$ . We use any other point  $Q(x, y)$  on the line to write an equation for the slope,  $m$ :



$$\text{Slope} = \frac{\text{rise}}{\text{run}}$$

$$m = \frac{y - 5}{x - (-2)}$$

$$m = \frac{y - 5}{x + 2}$$

Substitute:  $m = -3$

$$-3 = \frac{y - 5}{x + 2}$$

Multiply each side by  $(x + 2)$ .

$$-3(x + 2) = (x + 2) \left( \frac{y - 5}{x + 2} \right) \quad \text{Simplify.}$$

$$-3(x + 2) = y - 5$$

$$y - 5 = -3(x + 2)$$

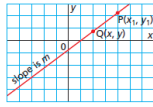
This equation is called the **slope-point form**; both the slope and the coordinates of a point on the line can be identified from the equation.

May 7-9:46 AM

**Connect**

We can use this strategy to develop a formula for the slope-point form for the equation of a line.

This line has slope  $m$  and passes through the point  $P(x_1, y_1)$ . Another point on the line is  $Q(x, y)$ .



The slope,  $m$ , of the line is:

$$m = \frac{\text{rise}}{\text{run}}$$

$$m = \frac{y - y_1}{x - x_1}$$

Multiply each side by  $(x - x_1)$ .

$$m(x - x_1) = (x - x_1) \left( \frac{y - y_1}{x - x_1} \right) \quad \text{Simplify.}$$

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

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

May 7-9:46 AM

**Connect** **EXAMPLE 1:**

**Slope-Point Form of the Equation of a Linear Function**

The equation of a line that passes through  $P(x_1, y_1)$  and has slope  $m$  is:  
 $y - y_1 = m(x - x_1)$

---

Graphing a Linear Function Given Its Equation in Slope-Point Form

a) Describe the graph of the linear function with this equation:

$$y - y_1 = m(x - x_1) \quad y - 2 = \frac{1}{3}(x - (-4)) \quad \text{slope} = \frac{1}{3}$$

$\downarrow$   
 $-(-)$  Point  $(-4, 2)$

The graph passes through  $P(-4, 2)$  and has a slope of  $\frac{1}{3}$

May 7-9:46 AM

**Connect** **EXAMPLE 1:**

Graphing a Linear Function Given Its Equation in Slope-Point Form

b) Graph the equation:

$$y - 2 = \frac{1}{3}(x + 4)$$

$$m = \frac{1}{3} \begin{matrix} \text{Rise} \\ \text{Run} \end{matrix}$$

$$P(-4, 2)$$

May 7-9:46 AM

**Practice** **YOU TRY!**

**Slope-Point Form of the Equation of a Linear Function**  
The equation of a line that passes through  $P(x_1, y_1)$  and has slope  $m$  is:  
 $y - y_1 = m(x - x_1)$

Graphing a Linear Function Given Its Equation in Slope-Point Form

a) Describe the graph of the linear function with this equation:

$$y + 1 = -\frac{1}{2}(x - 2) \quad \text{Slope} = -\frac{1}{2}$$

$$P(2, -1)$$

The line passes through  $P(2, -1)$  with a slope of  $-\frac{1}{2}$

May 7-9:46 AM

**Practice** **YOU TRY!**

Graphing a Linear Function Given Its Equation in Slope-Point Form

b) Graph the equation:

$$y + 1 = -\frac{1}{2}(x - 2)$$

$$m = -\frac{1}{2}$$

$$P(2, -1)$$

May 7-9:46 AM

**Connect** **EXAMPLE 2:**

Writing an Equation Using a Point on the Line and Its Slope

a) Write an equation in slope-point form for this line.

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

$$\rightarrow y + 2 = \frac{3}{4}(x + 1)$$

or  $y - 1 = \frac{3}{4}(x - 3)$

b) Write the equation in part a) in slope-intercept form. What is the y-intercept of this line?

$$y = mx + b$$

$$4(y + 2) = 3(x + 1)$$

$$4y + 8 = 3x + 3$$

$$4y = 3x + 3 - 8$$

$$4y = 3x - 5$$

$$\left\{ \begin{array}{l} 4y = 3x - 5 \\ 4 \quad 4 \quad 4 \end{array} \right. \rightarrow y = \frac{3}{4}x - \frac{5}{4}$$

May 7-9:46 AM

**Practice** **YOU TRY!**

Writing an Equation Using a Point on the Line and Its Slope

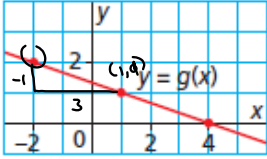
$m = -\frac{1}{3}$   $P(-2, 2)$

a) Write an equation in slope-point form for this line.

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

$\rightarrow y - 2 = -\frac{1}{3}(x + 2)$

$y - 1 = -\frac{1}{3}(x - 1)$



b) Write the equation in part a) in slope-intercept form.  
What is the y-intercept of this line?

$3(y - 2) = -1(x + 2)$

$3y - 6 = -x - 2$

$3y = -x + 4$

$y = -\frac{1}{3}x + \frac{4}{3}$

**Practice** **Practice Questions**

Textbook questions:

Page 372 # 4,5,6,8,9

Page 373 # 12, 14

May 7-9:46 AM

Apr 28-10:16 AM