Lesson 2.2 Point-Slope Form

Critique and Explain

Paul and Seth know that one point on a line is (4, 2) and the slope of the line is −5. Each student wrote a different equation relating x and y.

A) Do the two equations represent the same line? Construct a mathematical argument to support your answer.

B) Generate a table of values for each equation. How can you reconcile the tables with the equations?

Paul

$y = mx + b$
$2 = -5(4) + b$
$2 = -20 - b$
$22 = b$
$y = -5x + 22$

Seth

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$
$-5 = \dfrac{y - 2}{x - 4}$
$-5(x - 4) = y - 2$

$y = -5x + 22$		$-5(x - 4) = y - 2$	
x	y	x	y

Point-Slope Form

$$y - y_1 = m(x - x_1) \qquad (x_1, y_1)$$

(with "Slope" labeling m)

EXAMPLE 1

A line with a slope of $\frac{1}{2}$ ($\leftarrow m$) passes through the point (3, −2) (x_1, y_1).

Write an equation for the line.

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

Try it... A line with a slope of $-\frac{3}{4}$ half passes through the point (2, 7). Write an equation for the line.

$$y - 7 = -\tfrac{3}{4}(x - 2)$$

Example 2

Write an equation in point-slope form for a line passing through the points (−4, 1) and (2, 3).

(x_1, y_1) x_2, y_2

Step 1 Find Slope

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 1}{2 - (-4)} = \frac{2}{6} = \frac{1}{3}$$

Step 2 Write equation

$$y - 3 = \tfrac{1}{3}(x - 2)$$
$$\text{OR} \quad y - 1 = \tfrac{1}{3}(x + 4)$$

Try it... Write an equation in point-slope form for a line passing through the points (2, −1) and (−3, 3).

$$m = \frac{3 - (-1)}{-3 - 2} = \frac{4}{-5}$$

$$y - 3 = -\tfrac{4}{5}(x + 3)$$
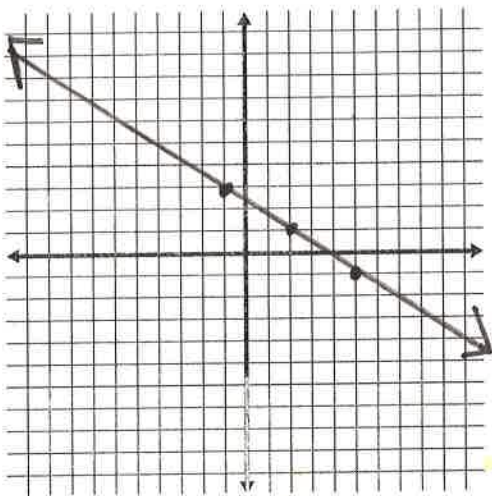$$\text{OR}$$
$$y + 1 = -\tfrac{4}{5}(x - 2)$$

EXAMPLE 3

What is the graph of $y - 3 = -\frac{2}{3}(x + 1)$?

Step 1 Identify point & plot it
(-1,3)

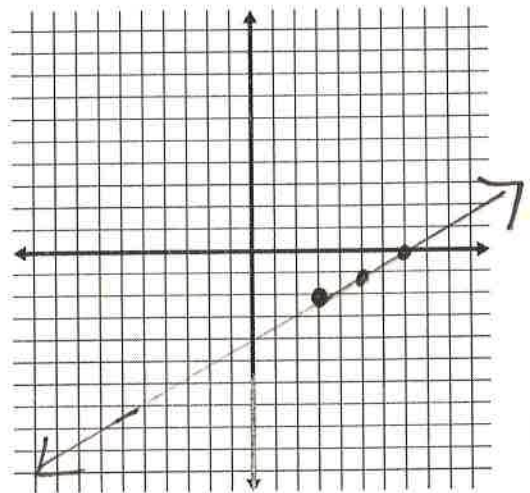**Step 2** use slope to plot 2 more points
$-\frac{2}{3}$ ↓2 →3

Step 3 Draw line with arrows

Try it... graph $y + 2 = \frac{1}{2}(x - 3)$

(3,-2)

$\frac{1}{2}$ ↑1 →2

EXAMPLE 4

An event facility has a banquet hall that can hold up to 250 people. The price for a party includes the cost of the room rental plus the cost of a meal for each guest. Marissa is planning an event for 75 people. She has budgeted $1,200 for the party. Will it be enough?

Step 1

Step 2

Step 3

Fantastic Fiestas

$725, $1,325, $1,925, $2,525, $3,125

Total Cost ($): 0, 500, 1,000, 1,500, 2,000, 2,500, 3,000, 3,500

Number of Guests: 0, 50, 100, 150, 200, 250