

## WARM UP

Solve the following equations for  $y_1$ .

$$\frac{5 - y_1}{2 + 5} = \frac{3}{7}$$

$$\frac{y_1 - 4}{9 + 3} = \frac{3}{4}$$

$$\frac{4 + y_1}{5 + 15} = \frac{1}{4}$$

$$\frac{y_1 - 5}{3 - 4} = \frac{3}{5}$$

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

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# ESSENTIAL QUESTION

What information does the point-slope form of a linear equation reveal about a line?

**NEEDED VOCAB:**

► **Point-Slope Form**

**GOAL: "I CAN..."**

**Write and graph linear equations in point-slope form."**

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  $y$ .

**Paul**

$$\begin{aligned} y &= mx + b \\ 2 &= -5(4) + b \\ 2 &= -20 + b \\ 22 &= b \\ y &= -5x + 22 \end{aligned}$$

**Seth**

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ -5 &= \frac{y - 2}{x - 4} \\ -5(x - 4) &= y - 2 \end{aligned}$$

Do you think both of these equations can be correct? How can you use math to prove your idea? (Work with your pod to come up with your answers.)

### EXAMPLE 1 Understand Point-Slope Form of a Linear Equation

What is the formula for the slope of a line?

$$\begin{aligned} \frac{a}{b} &= c \cdot b \\ a &= c \cdot b \end{aligned}$$

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

$$y_1 - y_2 = m(x_1 - x_2)$$

replace subscripts

Point slope.  $\rightarrow y - y_1 = m(x - x_1)$

↑ slope ↑

↑ point  $(x_1, y_1)$  ↑

1. If you know two points on a line, explain the steps you would go through in order to find the y-intercept of the line.

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**EXAMPLE 2** Write an Equation in Point-Slope Form

A. A line with a slope of  $\frac{1}{2}$  passes through the point  $(3, -2)$ . What form can you use to write the equation of the line? What is the equation in that form?

*slope intercept or point slope*  
*↑ easiest.*

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

B. What is the equation of the line that passes through  $(-4, 1)$  and  $(2, 3)$ .

$$\frac{3-1}{2-(-4)} = \frac{2}{6} = \frac{1}{3} = m \quad \boxed{y - 1 = \frac{1}{3}(x + 4)}$$

or

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

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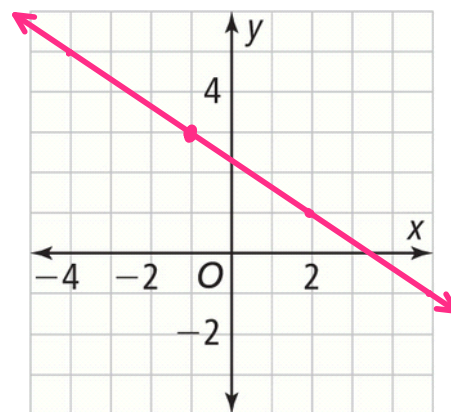
2. Write an equation of the line that passes through  $(2, -1)$  and  $(-3, 3)$ .

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**EXAMPLE 3** Sketch the Graph of a Linear Equation in Point-Slope Form

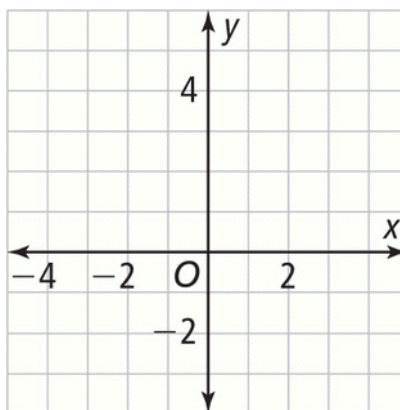
What is the graph of  $y - 3 = -\frac{2}{3}(x + 1)$ ?

$(-1, 3)$



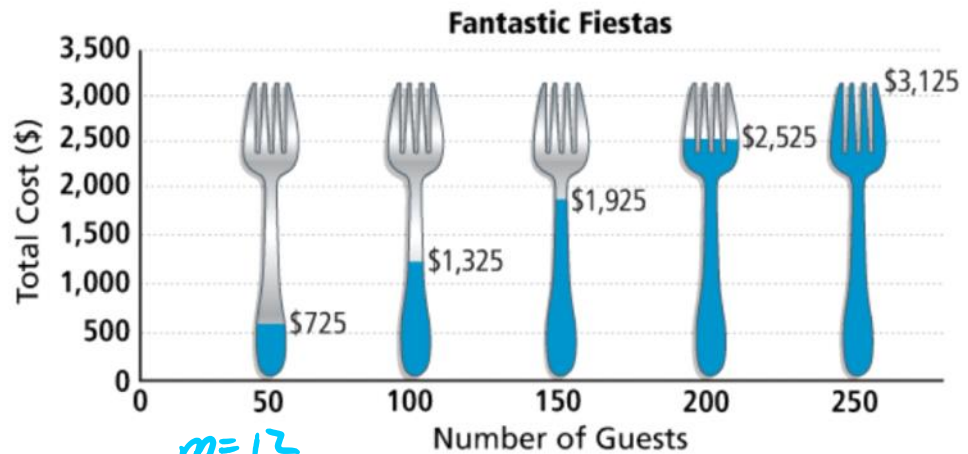
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3. Sketch the graph of  $y + 2 = \frac{1}{2}(x - 3)$ .



### 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?



$m = 12$   
 $y - 725 = 12(75 - 50)$   
 $y - 725 = 12(25)$   
 $y = 300 + 725$       $y = 1025$  ← cost of 75 ppl.  
yes it's enough.

4. Rewrite the point-slope form of the equation  $y - 725 = 12(x - 50)$  in slope-intercept form. What does the y-intercept represent in terms of the situation? Explain.

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## Point-Slope Form of a Linear Equation

**WORDS** The point-slope form of a linear equation is useful when you know the slope and at least one point on the line.

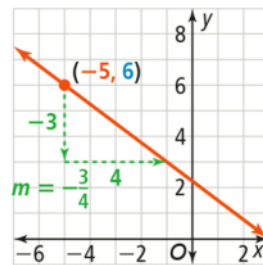
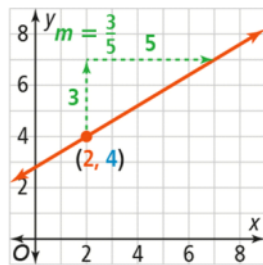
**ALGEBRA**

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

**NUMBERS**  $y - 4 = \frac{3}{5}(x - 2)$

$$y - 6 = -\frac{3}{4}(x + 5)$$

**GRAPH**



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# HOMework

Pg. 67

11(A, D), 12, 15-27 ODD, 28-36 EVEN