

## [2.2] Point - Slope Form

$$\begin{matrix} (x_1, y_1) \\ (x_2, y_2) \end{matrix}$$

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

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

$$m = \frac{\Delta y}{\Delta x}$$

$m = \text{slope}$   
 $(x_1, y_1)$  point

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

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

Point Slope Form

Point  
①  $(-1, -4)$   $m = \frac{2}{5}$   
     $\uparrow$   $x_1$   $\uparrow$   $y_1$

Point-Slope Form

$$y - -4 = \frac{2}{5}(x - -1)$$

$$y + 4 = \frac{2}{5}(x + 1)$$

Slope-int. Form

$$y - 4 = \frac{2}{5}x + \frac{2}{5}$$

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

$$\frac{2}{5} - \frac{4}{1}$$

$$\frac{2}{5} - \frac{20}{5}$$

$$-\frac{18}{5}$$

②  $(3, 6)$   $m = 5$   
     $x_1$   $y_1$

Point Slope Form

$$y - 6 = 5(x - 3)$$

Slope-int Form

$$y + 6 = 5x - 15$$

$$y = 5x + 9$$

③  $y - 8 = \frac{1}{4}(x + 2)$

Slope:  $\frac{1}{4}$

Point:  $(-2, 8)$

$$x + 2 = x - 2$$

④  $(2, 3)$   $(-4, 6)$

$$m = \frac{3 - 6}{2 - -4} = \frac{-3}{6} = -\frac{1}{2}$$

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

or

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

# Writing Equations in Point-Slope Form

(Pages 290–295)

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

For a given point  $(x_1, y_1)$  on a nonvertical line with slope  $m$ , the **point-slope form** of a linear equation is

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

The equation of a vertical line through a point at  $(x_1, y_1)$  is  $x = x_1$ .

## EXAMPLES

- A** Write the point-slope form of an equation of the line that passes through  $(2, 3)$  and has a slope of 5.

$$y - y_1 = m(x - x_1) \quad \text{Point-slope form}$$

$$y - 3 = 5(x - 2) \quad \text{Replace } x_1 \text{ with 2, } y_1 \text{ with 3, and } m \text{ with 5.}$$

An equation of the line is  $y - 3 = 5(x - 2)$ .

- B** Write the point-slope form of an equation of the line that passes through  $(0, 3)$  and  $(4, 0)$ .

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

$$= \frac{0 - 3}{4 - 0} \text{ or } -\frac{3}{4}$$

$$y - y_1 = m(x - x_1) \quad \text{Point-slope form}$$

$$y - 3 = -\frac{3}{4}(x - 0) \quad \text{Let } (x_1, y_1) = (0, 3).$$

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

## PRACTICE

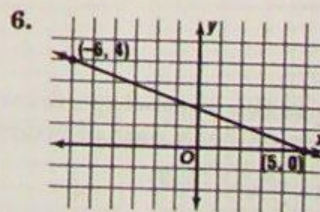
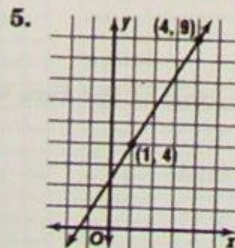
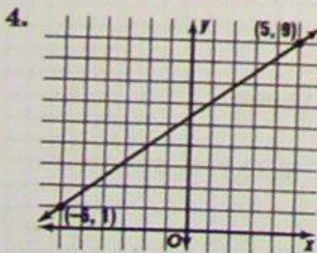
Write the point-slope form of an equation for each line passing through the given point and having the given slope.

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

2.  $(9, 7), m = -\frac{1}{4}$

3.  $(3, -6), m = 3$

Write the point-slope form of an equation for each line.



Write the point-slope form of an equation for each line.

7. the line through points at  $(-7, -8)$  and  $(2, -7)$

8. the line through points at  $(5, -8)$  and  $(2, -5)$

9. the line through points at  $(-6, -8)$  and  $(5, -8)$

10. **Standardized Test Practice** What is the point-slope form of an equation of the line that passes through  $(3, -3)$  and has a slope of 1?

A  $y - 3 = x - 3$

B  $y + 3 = x - 3$

C  $y = x$

D  $y - 3 = x + 3$

Write each equation in slope-intercept form.  $y = mx + b$

16.  $y + 2 = 4(x + 2)$

17.  $y + 1 = -7(x + 1)$

18.  $y - 3 = -5(x + 12)$

19.  $y - 5 = \frac{3}{2}(x + 4)$

20.  $y - \frac{1}{4} = -3\left(x + \frac{1}{4}\right)$

21.  $y - \frac{2}{3} = -2\left(x - \frac{1}{4}\right)$

Write the point-slope form of an equation of the line that passes through each pair of points.

5.  $(-6, 1), (5, 9)$

6.  $(4, 9), (1, 4)$

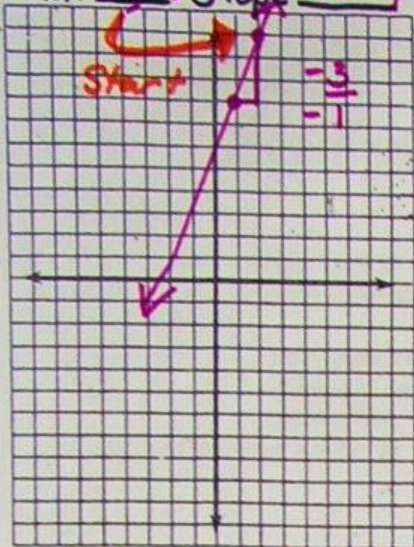
7.  $(5, 0), (-6, 4)$

Ex. 4

Graph the following linear equations using the point and slope. (Be sure to indicate the point and draw the "stair-step" for the slope.)  $y - y_1 = m(x - x_1)$

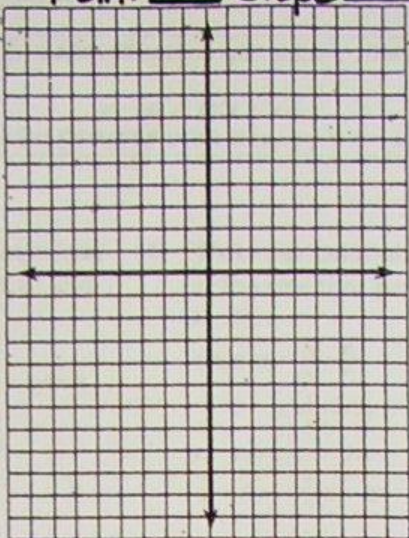
7.  $y - 11 = 3(x - 2)$

Point (2, 11) Slope  $3 = \frac{3}{1}$



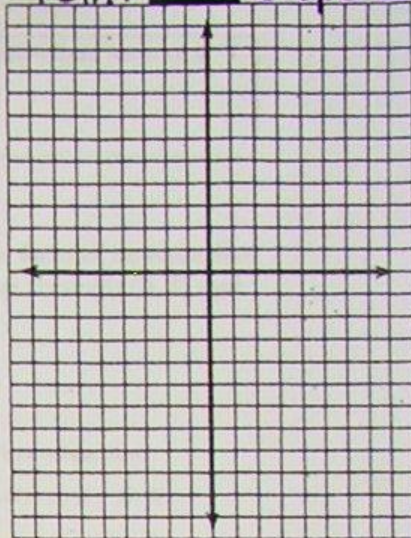
8.  $y - 10 = -(x - 2)$

Point \_\_\_\_\_ Slope \_\_\_\_\_



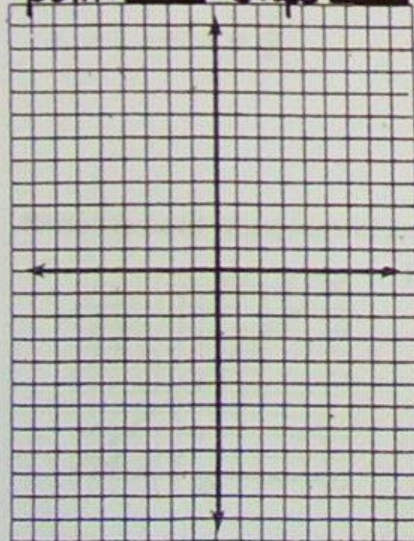
9.  $y + 7 = 2(x + 5)$

Point \_\_\_\_\_ Slope: \_\_\_\_\_



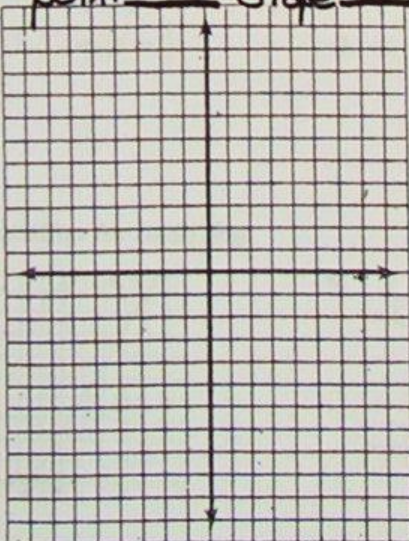
10.  $y - 5 = \frac{3}{2}(x + 4)$

point \_\_\_\_\_ Slope \_\_\_\_\_



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

point \_\_\_\_\_ Slope \_\_\_\_\_



12.  $y - 6 = \frac{4}{3}(x - 3)$

Point \_\_\_\_\_ Slope \_\_\_\_\_

