

Writing Equations in Point-Slope Form

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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

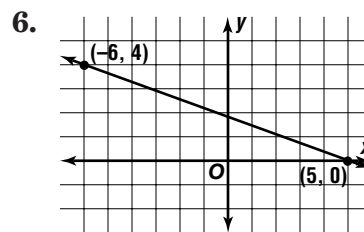
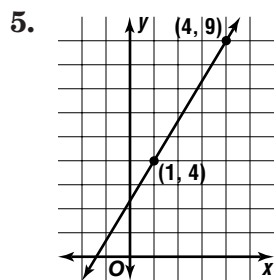
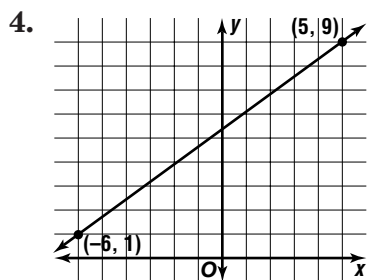
Write the point-slope form of an equation for each line passing through the given point and having the given slope.

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.



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 $y - 3 = x + 3$

Answers: 1. $y + 4 = \frac{2}{5}(x + 1)$ 2. $y - 7 = -\frac{1}{4}(x - 9)$ 3. $y + 6 = 3(x - 3)$ 4. $y - 9 = -\frac{11}{8}(x - 5)$ or $y - 1 = -\frac{11}{8}(x + 6)$
 5. $y - 4 = \frac{3}{5}(x - 1)$ or $y - 9 = -\frac{3}{5}(x - 4)$ 6. $y - 4 = -\frac{11}{4}(x - 5)$ or $y - 4 = -\frac{11}{4}(x - 5)$ 7. $y + 8 = \frac{1}{9}(x + 7)$ or $y + 7 = \frac{1}{9}(x - 2)$
 8. $y + 5 = -1(x - 2)$ or $y + 8 = -1(x - 5)$ 9. $y + 8 = -1(x - 5)$ 10. **B**