

5-5 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 having slope of m , the point-slope form of a linear equation is as follows: $y - y_1 = m(x - x_1).$ The linear equation of a vertical line, which has an undefined slope, through a point (x_1, y_1) is $x = x_1$.
Standard Form	The standard form of a linear equation is $Ax + By = C$, where A , B , and C are integers, $A \geq 0$, and A and B are not both zero.

Examples

- a. Write the equation, first in point-slope form and then in standard form, of the line that passes through $(2, 3)$ and has a slope of 5.

Point-Slope Form $y - y_1 = m(x - x_1)$
 $y - 3 = 5(x - 2)$

$y - 3 = 5x - 10$ Distribute.
 $5x - 10 = y - 3$ Reflexive Property (=)
 $5x - y = 7$ Add 10 and subtract y from each side.

Standard Form $5x - y = 7$, where $A = 5$, $B = -1$, and $C = 7$.

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

slope $m = \frac{y_2 - y_1}{x_2 - x_1}$
 $= \frac{0 - 3}{4 - 0}$ or $-\frac{3}{4}$

Point-Slope Form
 $y - y_1 = m(x - x_1)$

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

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

Practice

1. Write the point-slope form of an equation of the line that passes through the point $(-1, -4)$ and has a slope of $\frac{2}{5}$.

Write the standard form of an equation of the line that passes through the given point and has the given slope.

2. $(3, -6)$, $m = 3$ 3. $(9, 7)$, $m = -\frac{1}{4}$ 4. $(6, -3)$, $m =$ undefined

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. $(5, 0)$, $(-6, 4)$
 8. $(-7, -8)$, $(2, -7)$ 9. $(5, -8)$, $(2, -5)$ 10. $(-6, -8)$, $(5, -8)$

11. **Standardized Test Practice** What is the standard form of an equation of the line that passes through $(3, -3)$ and $(-1, 1)$?

- A $x - y = 0$ B $x + y = 0$ C $y = -(x + 1)$ D $2x + 2y = 3$

Answers: 1. $y + 4 = \frac{5}{2}(x + 1)$ 2. $3x - y = 15$ 3. $x + 4y = 37$ 4. $x + 0y = 6$ 5. $y - 9 = -\frac{11}{8}(x - 5)$ or $y - 1 = \frac{11}{8}(x + 6)$
 6. $y - 4 = \frac{3}{5}(x - 1)$ or $y - 9 = \frac{3}{5}(x - 4)$ 7. $y = -\frac{11}{4}x - 4$ or $y - 4 = -\frac{11}{4}(x + 6)$ 8. $y + 8 = \frac{6}{1}(x + 7)$ or $y + 7 = \frac{6}{1}(x - 2)$
 9. $y + 5 = -1(x - 2)$ or $y + 8 = -1(x - 5)$ 10. $y + 8 = 0(x - 5)$ or $y + 8 = 0(x - 5)$ or $y + 8 = 0(x - 5)$ 11. B