

Lesson 5-5

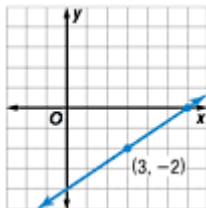
Example 1 Write an Equation Given Slope and a Point

Write the point-slope form of an equation for a line that passes through $(3, -2)$ with slope $\frac{2}{3}$.

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

$$y - (-2) = \frac{2}{3}(x - 3) \quad (x_1, y_1) = (3, -2)$$

$$y + 2 = \frac{2}{3}(x - 3) \quad \text{Simplify.}$$



Therefore, the equation is $y + 2 = \frac{2}{3}(x - 3)$.

Example 2 Write an Equation of a Horizontal Line

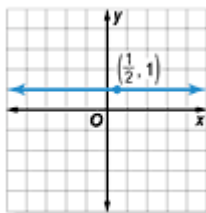
Write the point-slope form of an equation

for a horizontal line that passes through $(\frac{1}{2}, 1)$.

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

$$y - 1 = 0(x - \frac{1}{2}) \quad (x_1, y_1) = (\frac{1}{2}, 1)$$

$$y - 1 = 0 \quad \text{Simplify.}$$



Therefore, the equation is $y - 1 = 0$.

Example 3 Write an Equation in Standard Form

Write $y - 4 = 1.6(x + 2)$ in standard form.

In standard form, the variables are on the left side of the equation. A , B , and C are all integers.

$$y - 4 = 1.6(x + 2) \quad \text{Original Equation}$$

$$5(y - 4) = 5(1.6)(x + 2) \quad \text{Multiply each side by 5 to eliminate the decimal.}$$

$$5y - 20 = 8(x + 2) \quad \text{Distributive Property}$$

$$5y - 20 = 8x + 16 \quad \text{Distributive Property}$$

$$5y - 20 + 20 = 8x + 16 + 20 \quad \text{Add 20 to each side.}$$

$$5y = 8x + 36 \quad \text{Simplify.}$$

$$5y - 8x = 8x + 36 - 8x \quad \text{Subtract } 8x \text{ from each side.}$$

$$-8x + 5y = 36 \quad \text{Simplify.}$$

The standard form of the equation is $-8x + 5y = 36$.

Example 4 Write an Equation in Slope-Intercept Form

Write $y + 1 = -3(x + 3)$ in slope-intercept form.

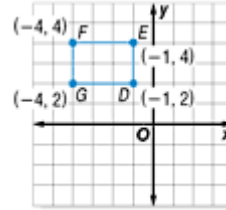
In slope-intercept form, y is on the left side of the equation. The constant and x are on the right side.

$$\begin{aligned} y + 1 &= -3(x + 3) && \text{Original equation} \\ y + 1 &= -3x - 9 && \text{Distributive Property} \\ y + 1 - 1 &= -3x - 9 - 1 && \text{Subtract 1 from each side.} \\ y &= -3x - 10 && \text{Simplify.} \end{aligned}$$

The slope-intercept form of the equation is $y = -3x - 10$.

Example 5 Write an Equation in Point-Slope Form

The figure shows rectangle $DEFG$.



a. Write the point-slope form of the line containing the diagonal \overline{FD} of the rectangle.

Step 1 First, find the slope of \overline{FD} .

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} && \text{Slope formula} \\ &= \frac{4 - 2}{-4 - (-1)} \text{ or } -\frac{2}{3} && (x_1, y_1) = (-1, 2), (x_2, y_2) = (-4, 4) \end{aligned}$$

Step 2 You can use either point for (x_1, y_1) in the point-slope form.

Method 1 Use $(-1, 2)$

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

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

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

Method 2 Use $(-4, 4)$

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

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

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

b. Write each equation in standard form.

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

Original equation

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

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

Multiply each side by 3.

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

$$3y - 6 = -2(x + 1)$$

Multiply.

$$3y - 12 = -2(x + 4)$$

$$3y - 6 = -2x - 2$$

Distributive Property

$$3y - 12 = -2x - 8$$

$$3y = -2x + 4$$

Add to each side.

$$3y = -2x + 4$$

$$2x + 3y = 4$$

Add $2x$ to each side

$$2x + 3y = 4$$

Regardless of which point was used to find the point-slope form, the standard form results in the same equation.