

Point-Slope Form of a Linear Equation

The line with slope m that contains the point (x_1, y_1) can be described by the equation $y - y_1 = m(x - x_1)$.

Example 1: Write an equation in point-slope form for the line with the given slope that contains the given point.

a.) slope = 4 $(2, 5)$

$$m = 4$$

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

$$y - 5 = 4(x - 2)$$

b.) slope = $\frac{1}{2}$ $(-3, 1)$

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

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

Example 2: Write the equation in slope-intercept form for the line with the given slope that contains the given point.

Step 1: Write the equation in point-slope form.

Step 2: Write the equation in slope intercept form by solving for y .

a. Slope = -2 $(3, 2)$

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

$$y - 2 = -2(x - 3)$$

$$y - 2 = -2x + 6$$

$$y = -2x + 8$$

b. Slope = 3 $(-1, 4)$

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

$$y - 4 = 3(x + 1)$$

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

$$y = 3x + 7$$

c. slope = $\frac{1}{3}$ $(-6, 2)$

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

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

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

$$y = \frac{1}{3}x + 4$$

d. slope = $\frac{2}{5}$ $(10, -3)$

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

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

$$y + 3 = \frac{2}{5}x - 4$$

$$y = \frac{2}{5}x - 7$$

e. Slope = 0 $(-1, 1)$

$$y = 1$$

*special case

f. slope is undefined & passes through $(4, 3)$

$$x = 4$$

*special case

HOY

- Horizontal
- 0 slope
- $y = \#$

VUX

- vertical
- undefined
- $x = \#$

Try it! Write the equation in (a) point-slope form and (b) slope-intercept form.

a. $m=2$, through $(\frac{1}{2}, 1)$

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

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

$$\begin{array}{r} y - 1 = 2x - 1 \\ +1 \quad \quad +1 \end{array}$$

b) $y = 2x$

b. Slope = 0, through $(3, -4)$

HOY

$$y = -4$$

c. Slope = undefined, through $(-2, 5)$

VUX

$$x = -2$$

d. Slope = $\frac{2}{3}$, through $(-6, 3)$

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

a) $y - 3 = \frac{2}{3}(x + 6)$

$$\begin{array}{r} y - 3 = \frac{2}{3}x + 4 \\ +3 \quad \quad +3 \end{array}$$

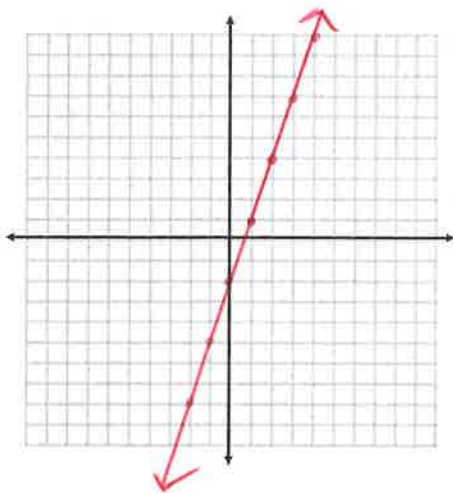
b) $y = \frac{2}{3}x + 7$

Example 3: Use point-slope form to graph.

1. $y - 1 = 3(x - 1)$

Point: $(1, 1)$

Slope: 3



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

Point: $(1, -2)$

Slope: $\frac{1}{2}$

