

Section 5.5 Point Slope Form of a Linear Equation

The slope can be found by the $\frac{\text{rise}}{\text{run}}$ or by $m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$

We can use that formula to find a new form of the linear equation by substituting x and y back in for x_2 and y_2 .

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

If we multiply both sides by $(x - x_1)$ to get the y 's by themselves, we end up with

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

If we flip the equation over we get

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

Example 1: Write an equation of the line that has a slope of 3 and goes through point (2,7).

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

$$(x_1, y_1) = (2, 7) \quad \text{our point}$$

$$m = 3 \quad \text{our slope}$$

$$\mathbf{y - 2 = 3(x - 7)} \quad \text{substitute the point and slope into the equation}$$

Example 2: Write an equation of the line that goes through (5,2) and (3,7). Use point slope form.

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

$$m = \frac{\text{rise}}{\text{run}} = \frac{5}{-2} = -\frac{5}{2}$$

$$y - 2 = -\frac{5}{2}(x - 5) \quad \text{substitute the point and slope into the equation}$$

OR...

$$y - 7 = -\frac{5}{2}(x - 3) \quad \text{substitute the OTHER point and slope into the equation}$$

Please notice that either answer is correct even though they look very different. If we were to put them in function form they would both look the same:

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

$$y - 2 = -\frac{5}{2}x + \frac{25}{2}$$

$$y - 2 + \frac{4}{2} = -\frac{5}{2}x + \frac{25}{2} + \frac{4}{2}$$

$$y = -\frac{5}{2}x + \frac{29}{2}$$

distribute

add 2 to both sides

slope intercept form

distribute

add 7 to both sides

slope intercept form

$$y - 7 = -\frac{5}{2}(x - 3)$$

$$y - 7 = -\frac{5}{2}x + \frac{15}{2}$$

$$y - 7 + \frac{14}{2} = -\frac{5}{2}x + \frac{15}{2} + \frac{14}{2}$$

$$y = -\frac{5}{2}x + \frac{29}{2}$$