

## Lesson 5: Equation of a Line Using Point-Slope Form - 1

We need to be able to make an equation for a line given some information. To do this we need to remember 2 formulas:

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad y = mx + b$$

**Easy case:** Given slope and y-intercept.

**Example 1:** Find the equation of a line with slope  $\frac{3}{5}$  and y-int 7.

$$y = mx + b$$

$$y = \frac{3}{5}x + 7$$

**Harder case:** Given slope and a point (not y-int.)

We will use a modified slope formula  $m = \frac{y - y_1}{x - x_1}$  and

Plug slope in for  $m$  and the point into  $(x_1, y_1)$

**Example 2:** Find the equation of a line passing through  $(-2, 5)$ , with a slope of -3.

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

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

$$\frac{-3}{1} = \frac{y - 5}{x + 2}$$

$$-3(x + 2) = y - 5$$

1. sub into equation

2. cross multiply

$$y - 5 = -3(x + 2)$$

$$y - 5 = -3x - 6$$

$$y = -3x - 1$$

point-slope form of the equation

$$y - 5 = -3(x + 2)$$

slope-intercept form

$$(y = mx + b)$$

$$y = -3x - 1$$

The **Point-slope** form of an equation is written as:

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

where  $(x_1, y_1)$  is a point on the line and  $m$  is the slope.

Both the slope and the point can be identified from the equation!

**Example 3:** Find equation of line with slope  $\frac{2}{3}$  passing through  $(3, 4)$ ,  
using both slope-intercept form and point-slope form.

point slope form

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

slope int. form

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

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

**Example 4:** Write an equation in point-slope form of the line that passes through  $(-2, -3)$  and has a slope of  $-\frac{1}{4}$ .

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

$$y - (-3) = -\frac{1}{4}(x - (-2))$$

$$y + 3 = -\frac{1}{4}(x + 2)$$

**Example 5:** Identify the slope of the line and a point on the line from this equation:

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

$$m = -\frac{3}{4}$$

$$y - y_1 = m(x - x_1) \quad P(-2, 5)$$

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

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