

## Lesson 7 Slope-Point Form of a Linear Function

The equation of a line that passes through  $P(x_1, y_1)$  and has slope  $m$  is

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

*slope* (under  $m$ )  
*Point on the line* (under  $x_1$ )

In order to find an equation for a line, you must know:

- The slope
- A point on the line

### There are three types of questions

1. Given the slope and y-intercept
2. Given the slope and one point (x-int, y-int, coordinate pair)
3. Given two points

### There are two methods to use when solving:

1. Slope-Intercept Form ( $y = mx + b$ )
  2. Point-Slope Formula ( $y - y_1 = m(x - x_1)$ )
- point (x<sub>1</sub>, y<sub>1</sub>)* (under  $x_1$ )  
*slope* (under  $m$ )

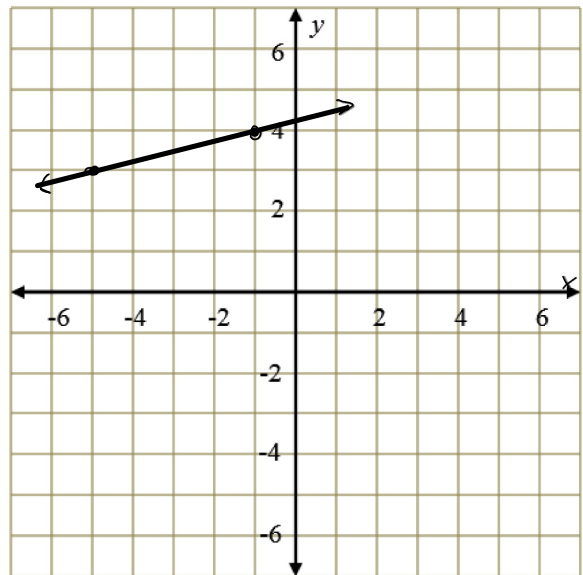
Sketch the graph of the linear function with equation:

$$y - 3 = \frac{1}{4}(x + 5)$$

$$y - 3 = \frac{1}{4}(x - (-5))$$

$\uparrow$   $y_1$                        $\uparrow$   $x_1$   
Pt  $(-5, 3)$

- ① Plot this point
- ② Use the slope to determine another point on the line  
 $m = \frac{1}{4}$      $\frac{\text{rise}}{\text{run}}$     go up 1, right 4



**Type I – Given Slope and y-intercept**

Write the equation of a line with a slope of  $\frac{2}{3}$  and a y-intercept of  $-1$ .  $(x_1, y_1)$   $(0, -1)$

slope-intercept

$$y = mx + b$$

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

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

$m$

slope-point

$$y + 1 = \frac{2}{3}(x - 0)$$

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

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

**Type II – Given a Point and the Slope**

**Example 1**

Determine the equation of a line with a slope of 3 that passes through

$(1, 4)$ .  
 $(x_1, y_1)$

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

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

← slope-point form

**Example 2**

Write the equation of a line passing through  $(-4, -2)$  with  $m = \frac{2}{3}$ .  
 $(x_1, y_1)$

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

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

**Type III – Given Two Points**

**Example 3**

Determine the equation of the line passing through the points D (6, 1) and E (-4, -3).

① Use the slope formula to calculate the slope

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{-3 - 1}{-4 - 6}$$

$$m = \frac{-4}{-10}$$

$$m = \frac{2}{5}$$

② Use the slope and one of the points to write the eqn.

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

$$m = \frac{2}{5}$$

$$y - 1 = \frac{2}{5}(x - 6)$$

pt D (6, 1)