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; point on the line)

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_1, y_1); slope)

Sketch the graph of the linear function with equation:

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

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

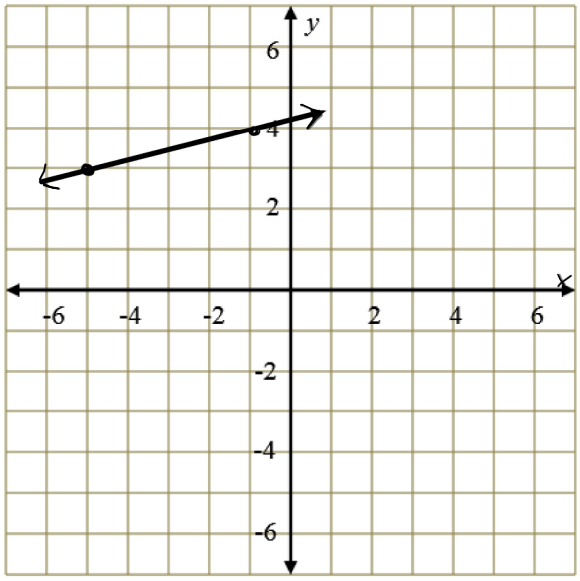
y_1 $\quad x_1$

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.

slope-intercept

$y = mx + b$

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

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

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

$y - (-1) = \frac{2}{3}(x - 0)$ x_1 y_1 $(0, -1)$

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 m

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

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

↖ slope-point form

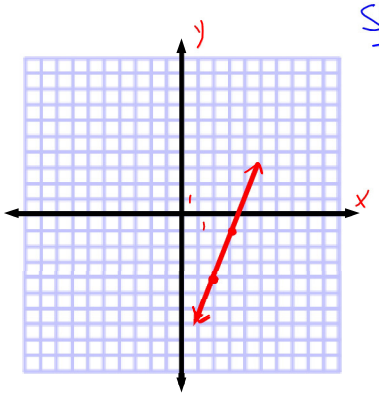
Example 2

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

x_1 y_1

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

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



Sketch

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

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

y_1 x_1

pt $(2, -4)$

slope $\frac{3}{1}$ up right

Type III – Given Two Points

Example 3

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

x_1 y_1 x_2 y_2

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.

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

pt D (6, 1)

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

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

or

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

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

pt E (–4, –3)

pg. 247
#5 a, c
7, 8
10 g
11 a, c, e (slope-point form)