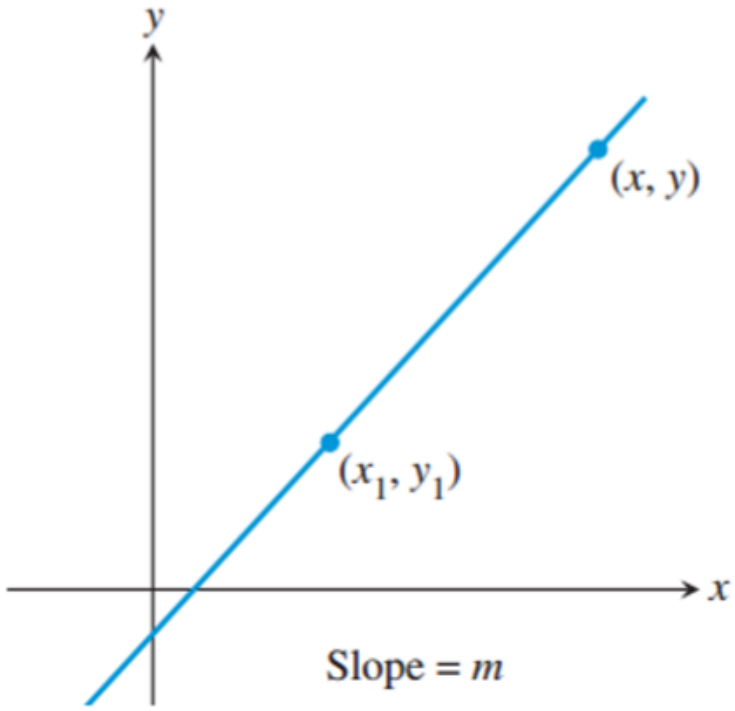
DEFINITION Slope of a Line

The **slope** of the nonvertical line through the points (x_1, y_1) and (x_2, y_2) is

delta means "change"

$$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}.$$

If the line is vertical, then $x_1 = x_2$ and the slope is undefined.



DEFINITION Point-Slope Form of an Equation of a Line

The **point-slope form** of an equation of a line that passes through the point (x_1, y_1) and has slope m is

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

slope $\frac{3}{4}$

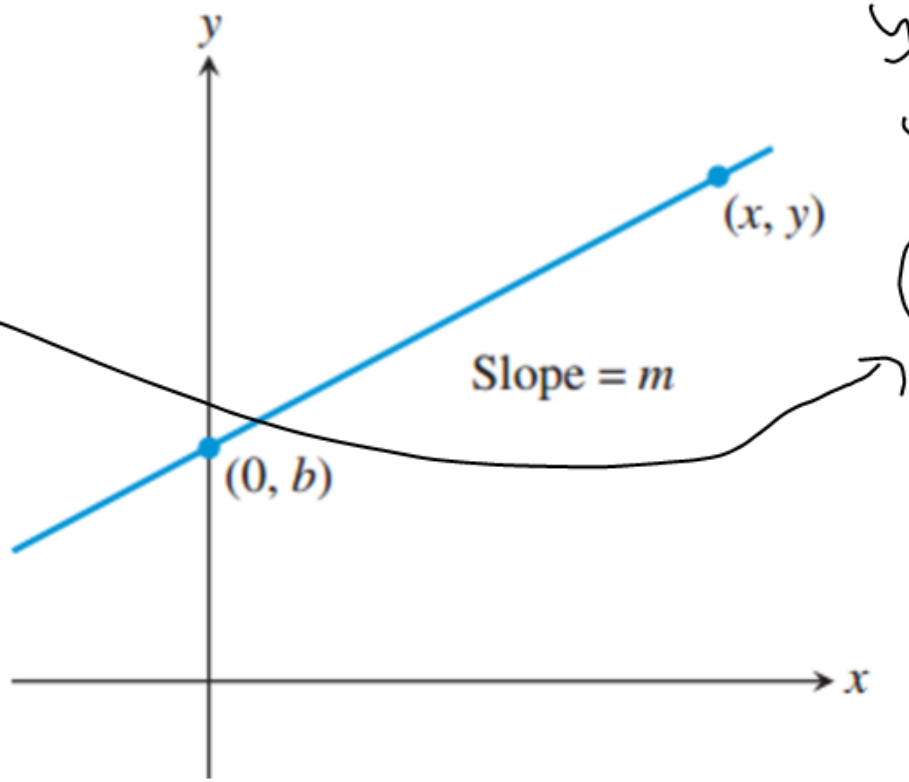
point (x_1, y_1) $(-2, 1)$

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

DEFINITION Slope-Intercept Form of an Equation of a Line

The **slope-intercept form** of an equation of a line with slope m and y-intercept $(0, b)$ is

$$y = mx + b.$$



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

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

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

$+1 \qquad +1$

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

Use a Graphing Utility

Draw the graph of $2x + 3y = 6$.

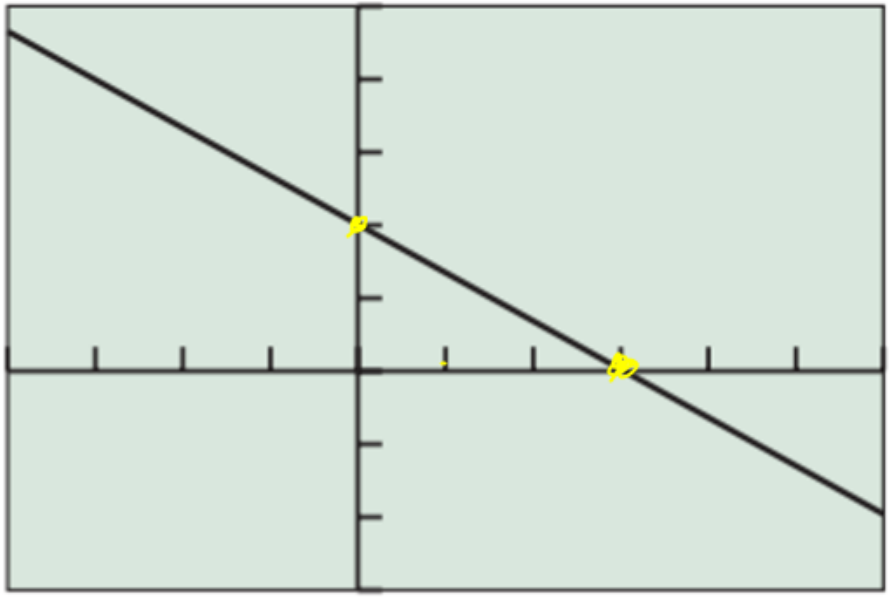
$3y = -2x + 6$

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

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

(0, 2)

(3, 0)



[–4, 6] by [–3, 5]

Domain range

Parallel and Perpendicular Lines

1. Two nonvertical lines are parallel if and only if their slopes are equal.

2. Two nonvertical lines are perpendicular if and only if their slopes m_1 and m_2 are opposite reciprocals. That is, if and only if

$$m_1 = -\frac{1}{m_2}.$$

Finding an Equation of a Perpendicular Line

Find an equation of the line through $P(2, -3)$ that is perpendicular to the line L with equation $4x + y = 3$. Support the result with a grapher.

$y = -4x + 3$

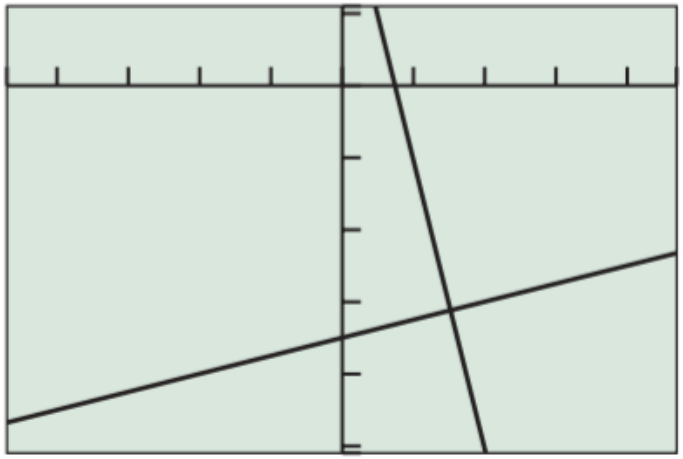
$m_1 = -4$

$\therefore \quad m_2 = \frac{1}{4}$

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

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

$y = \frac{1}{4}x - \frac{7}{2}$



[–4.7, 4.7] by [–5.1, 1.1]