§ 2.3 Lines

Slope of a Line

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

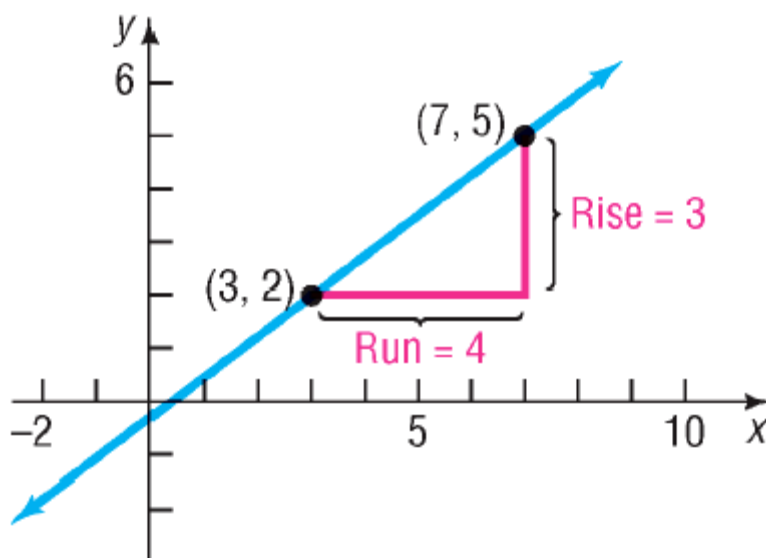$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}}$$

The slope of a **horizontal line is 0** and the slope of a **vertical line is undefined**.

Example   Find the slope of the line through $(1, 2)$ and $(5, -3)$.

Example   Find the slope of the line through $(2, 7)$ and $(2, -4)$.

Example   Find the slope of the line through $(5, -3)$ and $(-2, -3)$.

Example   Graph the line through (3, 2) having slope $m = \dfrac{3}{4}$.

Point-Slope Form of the Equation of a Line

The line with <u>slope m</u> passing through the point (x_1, y_1) has equation :

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

Example   Write the equation of the line in standard form.

a.) through $(1, 2)$ and $m = 4$

b.) through $(2, 3)$ and $(-4, 5)$

Slope-Intercept Form of the Equation of a Line

The line with <u>slope m</u> and <u>y-intercept</u> $(0, b)$ has equation

$$y = mx + b$$

Example   Find the slope and y-intercept of
$2x + 4y = 8$

Equation of a vertical line through the point (a, b) is:

$$x = a$$

Equation of a horizontal line through the point (a, b) is:

$$y = b$$

Parallel and Perpendicular Lines

- parallel lines have the same slope.
- the slopes of perpendicular lines are negative

reciprocals $\quad m_1 = -\dfrac{1}{m_2}$

Example   Show that two lines are parallel.
$L_1: = 2x + 3y = 6 \qquad\qquad L_2: 4x + 6y = 0$

Example   Write the equation of the line in standard form.

a) through $(2, -3)$ and parallel to $2x + y = 6$

b) through $(2, -3)$ and perpendicular to $2x + y = 6$