§ 2.1 Linear Equations in Two Variables

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 1 Find the slope of the line through (-4, 8) and (2, -3).

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

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

Example 4 Graph the line through (-2, -3) having slope m = 4.

Point-Slope Form of the Equation of a Line

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

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

Example 5 Write the equation of the line in standard form.

a.) through $(-4, 1)$ and $m = -3$ b.) through $(-3, 2)$ and $(2, -4)$

Slope-Intercept Form of the Equation of a Line

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

$$y = mx + b$$

Example 6 Find the slope and y-intercept of $3x - y = 2$

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

Example 7 Write the equation of the line in standard form.

a.) through (3, 5) and parallel to $2x + 5y = 4$

b.) through (3, 5) and perpendicular to $2x + 5y = 4$