Find the Slope of a Line.

1. Slope is the measure of the steepness of a line going from left to right.
2. The slope of a line through the points \((x_1, y_1)\) and \((x_2, y_2)\) is given by
   \[
   \text{slope} = \frac{\text{change in } y \text{ (vertical change)}}{\text{change in } x \text{ (horizontal change)}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}
   \]
3. The slope of a line is represented by the letter \(m\), so the formula for slope is
   \[
   m = \frac{y_2 - y_1}{x_2 - x_1}
   \]
   where \((x_1, y_1)\) and \((x_2, y_2)\) are any two points on the line.

Example 1 Use the slope formula to find the slope of a line through the given points.

a) \((5,2)\) and \((3,8)\)          b) \((-4,7)\) and \((2,10)\)

c) \((9,5)\) and \((9,12)\)          d) \((-3,4)\) and \((-3,-4)\)

Recognize Positive and Negative Slopes.

1. A line that rises from left to right has positive slope.
2. A line that falls from left to right has negative slope.

Example 2 Visually determine if the slope of the line is positive or negative, then use the slope formula to find the slope.

a) b)
Examine the Graphs of Horizontal and Vertical Lines
1. Every horizontal line has a slope of 0.
2. The slope of any vertical line is undefined.

Example 3 Use the slope formula to find the slope of each line.

Example 4 Graph the line with the given slope that goes through the given point.

Example 5 Let \( m_1 \) represent the slope of line 1, and \( m_2 \) represent the slope of line 2. Indicate whether line 1 and line 2 are parallel, perpendicular, or neither.

a) \( m_1 = \frac{3}{5}, \quad m_2 = \frac{-3}{5} \)  

b) \( m_1 = \frac{-2}{3}, \quad m_2 = \frac{3}{2} \)  

c) \( m_1 = \frac{2}{7}, \quad m_2 = \frac{2}{7} \)