

Chapter 2 Section 5 The Point-Slope Form of the Equation of a Line

One can use the slope of a line to obtain another useful form of the equation of a line. Consider a nonvertical line that has slope, m , and contains the point (x_1, y_1) and another arbitrary point (x, y) that is not fixed on the line.

$$m = \frac{\text{Change in } y}{\text{Change in } x} = \frac{y - y_1}{x - x_1}$$

$$m = \frac{y - y_1}{x - x_1} \text{ multiply both side by } x - x_1 \text{ where } x - x_1 \neq 0$$

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

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

Reverse the two sides:

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

this is the **point-slope form of the equation of a line**.

Using the Point-Slope form to Write a Line's Equation

Example 1: page 156:

Write the point-slope form and the slope-intercept form of the equation of the line with slope 7 that passes through the points $(-4, 5)$

Example 2: page 157:

Find the equation of the line that passes through the points $(1, -3)$ and $(-2, 4)$

Parallel and Perpendicular Lines

Two nonintersecting lines that lie in the same plane are parallel.

The ratio of the vertical change to the horizontal change is the same for each line.

Parallel lines have the same 'steepness'. The slopes are the same

Slope and Parallel Lines

1. If two nonvertical lines are parallel, then they have the same slope.
2. If two distinct nonvertical lines have the same slope, then they are parallel.
3. Two distinct vertical lines, both with undefined slopes, are parallel.

Example 4: page 160

Write an equation of a line passing through $(-3, 1)$ and parallel to the line whose equation is $y = 2x + 1$.

Perpendicular lines

Two lines that intersect at a right angle (90°) are said to be perpendicular. The product of the slopes of two perpendicular lines is -1 .

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Slope and Perpendicular Lines

1. If two nonvertical lines are perpendicular, then the product of their slopes is -1 .
2. If the product of the slopes of two lines is -1 , then the lines are perpendicular.
3. A horizontal line having zero slope is perpendicular to a vertical line having undefined slope.

Example 5 Page 161

a) Find the slope of any line that is perpendicular to the line whose equation is $x + 4y = 8$

b) Write the equation of the line passing through $(3, -5)$ and perpendicular to the line whose equation is $x + 4y = 8$