MATH 1314

Section 1.2

Lines

In this section, we'll review slope and different equations of lines. We will also talk about x-intercept and y-intercept, parallel and perpendicular lines.

Slope

Definition: The **slope** of a line measures the steepness of a line or the rate of change of the line.

To find the slope of a line you need two points. You can find the slope of a line between two points (x_1, y_1) and (x_2, y_2) by using this formula.

slope (m) =
$$\frac{y_2 - y_1}{x_2 - x_1}$$

Note:

-Lines with positive slope rise to the right.

-Line with negative slope fall to the right.

-Lines with slope equal to 0 are horizontal lines.

-Lines with undefined slope are vertical lines

Example 1: Find the slope of the line containing the following points

a. (4, -3) and (-2, 1)

b. (-3, 1) and (-3, -2)

Finding the Equation of a Line

Three usual forms:

1. Point-Slope Form

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

where (x_1, y_1) is a point on the line and m is the slope.

2. Slope-Intercept Form

$$y = mx + b$$

where *m* is the slope and b is the *y*-intercept of the line.

3. Standard Form

$$Ax + By + C = 0$$

where A and B are not both equal to 0.

Example 2: Write the following equation in slope-intercept form and identify the slope and y-intercept. 2x - 4y = 5

Example 3: Write an equation of the line that satisfies the given conditions.

a. $m = \frac{1}{2}$ and the *y*-intercept is 3.

b. m = -3 and the line passes through (-2, 1).

c. line passes through (-6, 10) and (-2, 2).

Parallel and Perpendicular Lines

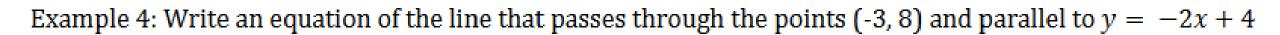
Definition: Parallel lines are lines with slopes m_1 and m_2 such that they are equal, in other words

$$m_1 = m_2$$

Definition: Perpendicular lines are lines in which the product of the slopes equal -1.

$$m_1 m_2 = -1$$

Also known as the negative reciprocal. $m_2 = \frac{-1}{m_1}$



Example 5: Write an equation of the line that passes through the points (1, 2) and perpendicular to y = -2x + 4.

x-intercept and y-intercept

When graphing an equation, it is usually very helpful to find the x intercept(s) and the y-intercepts of the graph. An x intercept is the first coordinate of the ordered pair of a point where the graph of the equation crosses the x axis. To find an x intercept, let y = 0 and solve the equation for x.

The y-intercept is the second coordinate of the ordered pair of a point where the graph of the equation crosses the y axis. To find a y intercept, let x = 0 and solve the equation for y.

Example 5: Find the x and y intercepts of the graph of the equation 3x - 4y = 8.

Example 6: Find the x and y intercepts of the graph of the equation $y = x^2 - 9$.