Math 1313
Chapter 1 – Section 1.2
Slopes of Lines, Equations of Lines and Graphing Lines

Slope of a Line

If (x_1, y_1) and (x_2, y_2) are any two distinct points on a line, then the slope is given by

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

Note:

- A line with positive slope will rise to the right.
- A line with negative slope will fall to the right.
- A line with a slope of zero is a horizontal line.
- A line with undefined slope is a vertical line.

Example 1: Find the slope of the line that passes through (-2, -2) and (4, -4).

Example 2: Find the slope of the line that passes through (2, 3) and (2, -2).

Example 3: Find the slope of the line that passes through $\left(\frac{-6}{11}, 0\right)$ and $\left(\frac{1}{5}, 0\right)$.

Example 4: Find the slope of the line that passes through (-1, 10) and (-3, -10).

Equations of Lines

Point-Slope Form

An equation of the line that has slope *m* and passes through the point (x_1, y_1) is given by

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

Slope-Intercept Form

The equation of the line that has slope *m* and *y*-intercept *b* is given by $y = mx + b.$

General Form of a Linear Equation

The equation A*x* + B*y* + C = 0 where A, B, and C are constants and A and B are not both zero is called the general form of a linear equation in two variables *x*, *y*.

Standard Form of a Linear Equation

The equation A*x* + B*y* = C where A, B, and C are constants and A and B are not both zero is called the standard form of a linear equation in two variables *x*, *y*.

Example 5: Given -3*x* + 4*y* = -16, find the slope and *y*-intercept.

Example 6: Write an equation of the line that has slope -2 and *y*-intercept -1/4.

Example 7: Write an equation of the line that has slope 2 and passes through (5, 8).

Example 8: Write an equation of the line that has slope $-\frac{3}{8}$ and passes through (-1, -6).

Example 9: Write an equation of the line that passes through (-3, 1) and (-1, -7).

Example 10: Write an equation of the line that passes through (0, -8) and (5, 0).

Parallel and Perpendicular Lines

Parallel Lines: Two lines with slopes m_1 and m_2 are parallel if and only if $m_1 = m_2$.

Perpendicular Lines: Two lines with slopes m_1 and m_2 are perpendicular if and only if one is the negative reciprocal of the other.

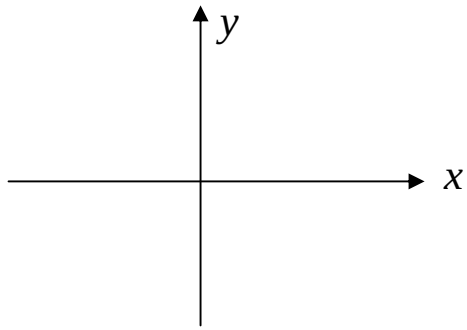
Example 11: Write an equation of the line that passes through (-2, 7) and is perpendicular to $y = -5x - 10$.

Example 12: Write an equation of the line that passes through (1, 2) and is parallel to $-10x + 5y = -10$.

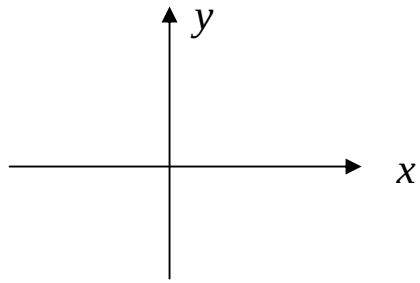
Example 13: Write an equation of the line that passes through (10, 15) and is perpendicular to the line that passes through (0, 4) and (-6, -2).

Example 14: Write an equation of the line that passes through (0, 2) and is parallel to the line that passes through (-5, 2) and (3, 8).

Example 15: Sketch the graph of $-\frac{1}{3}x + y = 1$ by using the slope and y-intercept.



Example 16: Sketch the graph of $-2x - 5y = 10$ by using the slope and y-intercept.

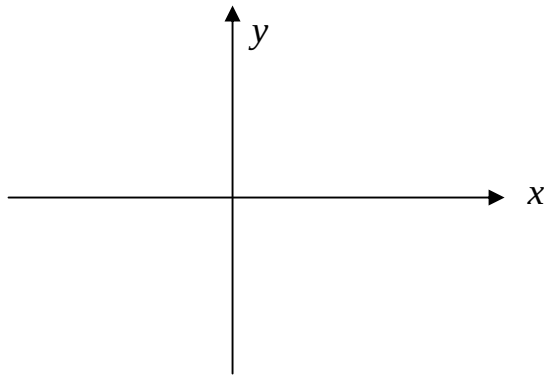


Intercepts of Graphs

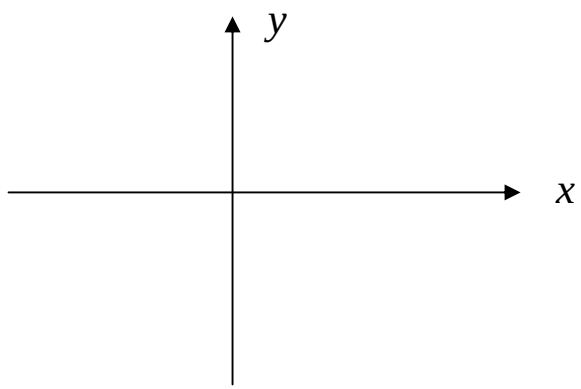
An ***x*-intercept** of a graph is the x-coordinate of a point where the graph intersects the x-axis. To find the x-intercept(s) of a graph, set $y = 0$ in the equation and solve for x.

A ***y*-intercept** of a graph is the y-coordinate of a point where the graph intersects the y-axis. To find the y-intercept of a graph, set $x = 0$ in the equation and solve for y.

Example 17: Sketch the graph of $3x + 8y = 24$ by first finding the x- and y-intercepts.



Example 18: Sketch the graph of $-7x + 9y = 18$ by first finding the x- and y-intercepts.



Example 19: Sketch the graph of $-2x = y$ by first finding the x- and y-intercepts.