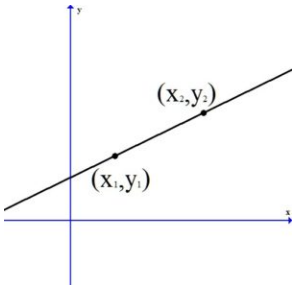
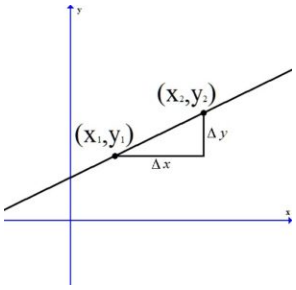
2.3 Lines

▼ Definition of Slope



Given two points on the line (x_1, y_1) and (x_2, y_2), you can calculate the slope of the linen by the formula

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta y}{\Delta x} = \frac{\text{the change in y}}{\text{the change in x}} = \frac{\text{rise}}{\text{run}}$$



▼ Example of Calculating Slope

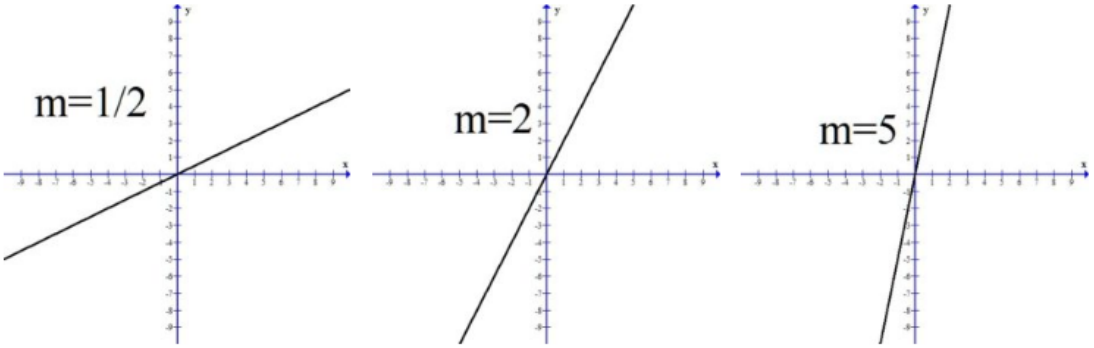
Example 1: Calculate the slope of the line containing $(-2, 1)$ and $(3, -4)$

▼ Interpretation of slope

The slope of a line is a number that indicates the "steepness" of a line. Slope is usually denoted by the letter m.

▼ What does it mean when the slope is positive?

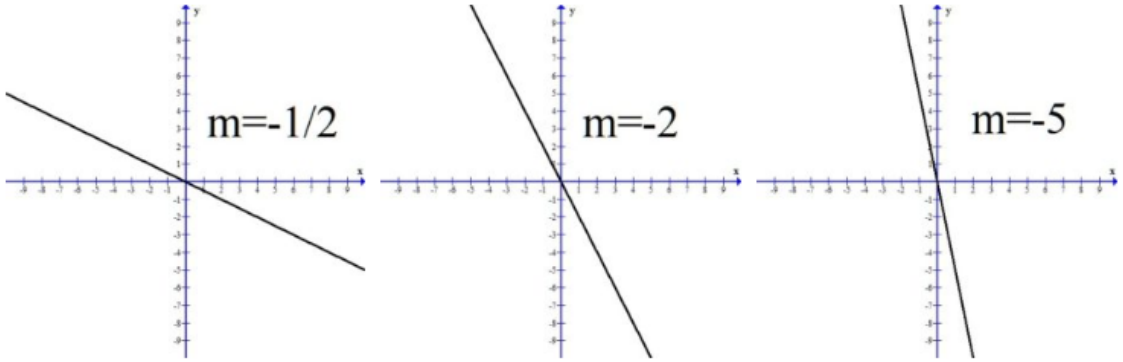
If the slope of the line is positive, the line will be rising or increasing from left to right.



All three of the above graphs have a positive slope and the line is rising or increasing from left to right. Notice as the value of the slope gets larger, the line is getting steeper.

▼ What does it mean when the slope is negative?

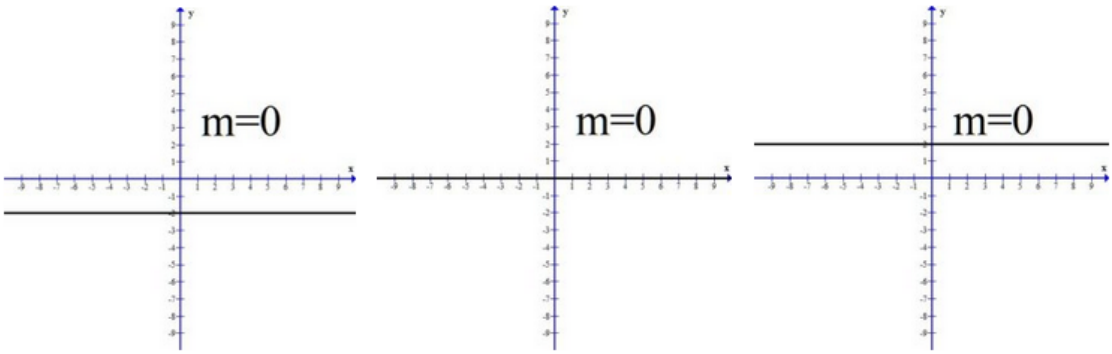
If the slope of the line is negative, the line will be falling or decreasing from left to right.



All three of the above graphs have a negative slope and the line is falling or decreasing from left to right. Notice as the value of the slope gets smaller, the line is getting steeper.

▼ What does it mean when the slope is zero?

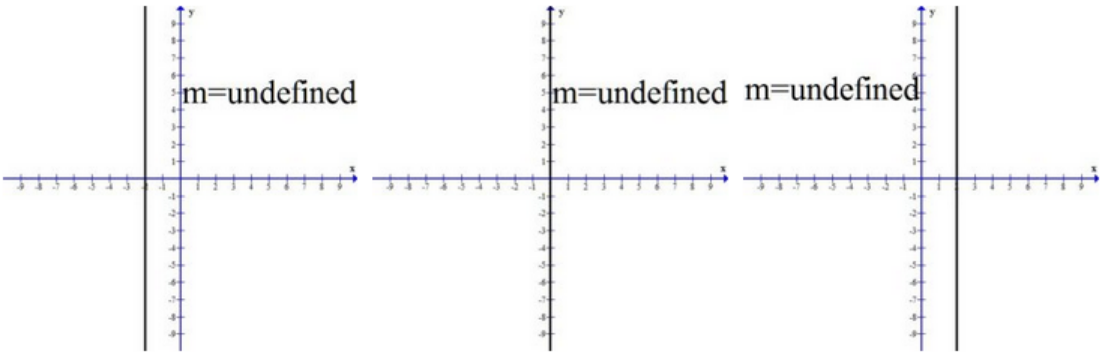
If the slope is zero, the line will be constant. This results in a horizontal line.



All three of the the above graphs have a slope of zero. The y values are constant.

▼ What does it mean when the slope is undefined?

A vertical line has a slope that is undefined.



All three of the vertical lines have undefined slope.

▼ Slope Intercept Form

The slope intercept form of a line is $y = mx + b$ where m is the slope of the line and $(0, b)$ is the y-intercept of the line.

▼ Example 1: Find the slope and y-intercept

$y = 3x - 5$

▼ Example 2: Find the slope and y-intercept

$y = -\frac{2}{3}x + 7$

▼ Example 3: Find the slope and y-intercept

$3x - 2y = 12$

▼ Standard Form

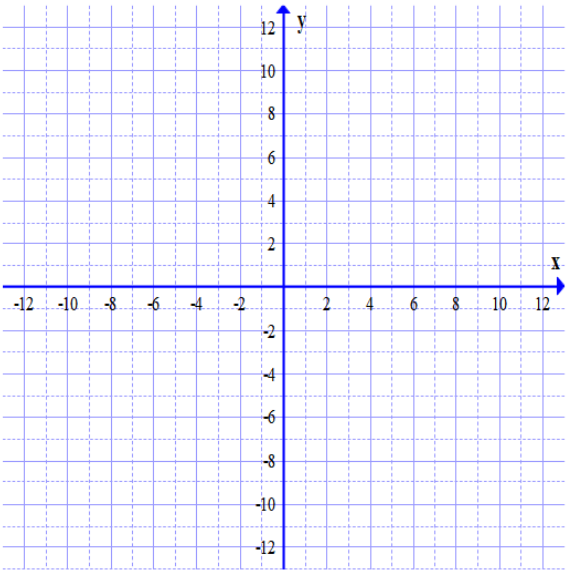
Standard form has both x and y terms on one side of the equation and the constant on the other side. Typically A, B and C are integers and A is positive. $Ax + By = C$

▼ Graphing Lines using slope intercept form

1. Plot the y-intercept
2. Starting from the y-intercept, use the slope to find a second point on the line
3. Connect the points with a straight line.

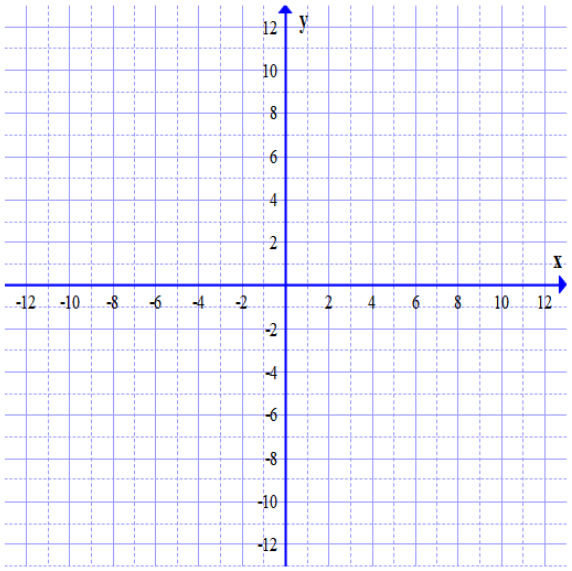
▼ Example 1: Graph the equation using slope intercept form.

$y = 3x - 5$



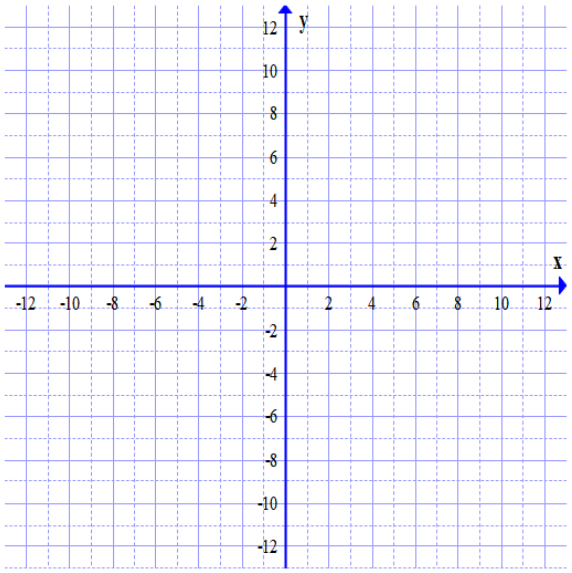
▼ Example 2: Graph the equation using slope intercept form.

$y = -\frac{2}{3}x + 7$



▼ Example 3: Graph the equation using slope intercept form.

$3x - 2y = 12$



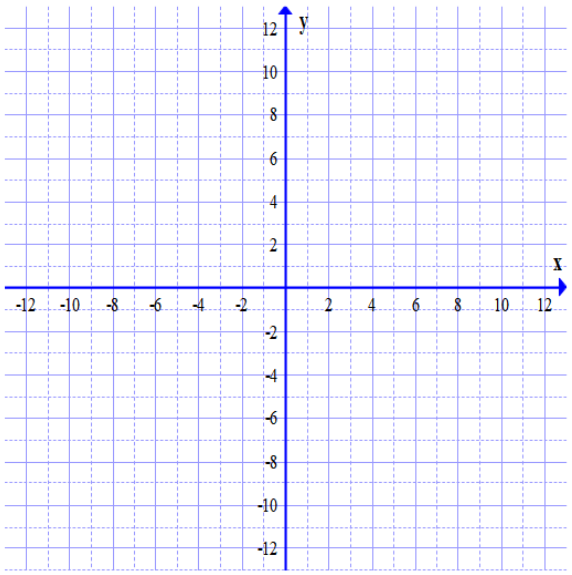
▼ Graphing Lines using the intercepts

1. Find the x and y intercepts

2. Plot the x and y intercepts
3. Connect the intercepts with a straight line

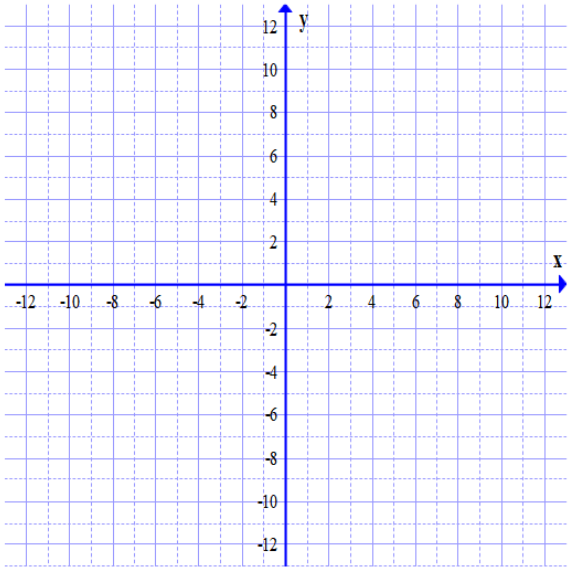
▼ Example 1: Graph the line using the intercepts

$3x - 2y = 12$



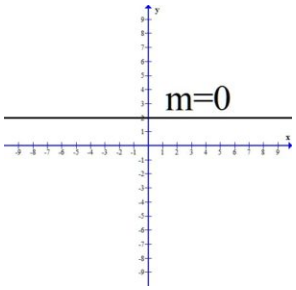
▼ Example 2: Graph the line using the intercepts

$y = -2x$



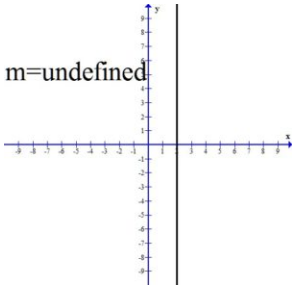
▼ Horizontal Lines

Most linear equations can be written in slope intercept form which is $y = mx + b$. Horizontal lines have a slope of zero so a horizontal line will have an equation of $y = b$



▼ Vertical Lines

Vertical lines have an undefined slope and cannot be written in slope intercept form. They will have an equation of $x = a$.



▼ Point Slope Form

Point slope from can be used for form a linear equation when you have a point $[(x_1, y_1)]$ on the line and the slope $[m]$ of the line.

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

▼ Find the Equation of the Line

▼ Find the Equation of the line given the slope and a point

Example 1: Find the equation of the line passing through the point $(-3, 7)$ with slope 2. Write the equation in point slope form, slope intercept form, and standard form.

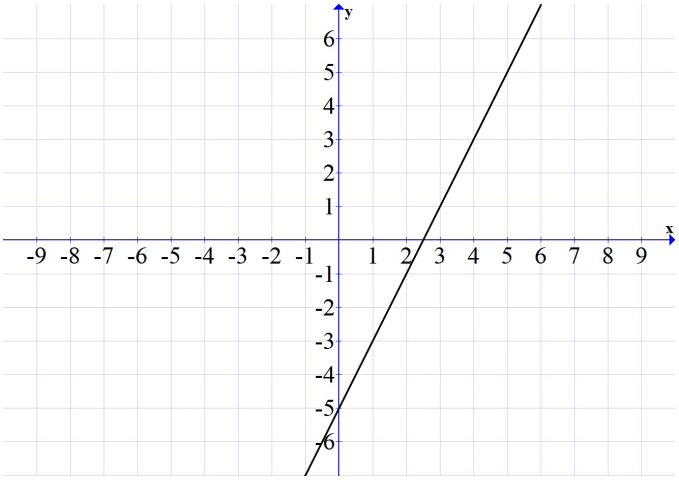
Example 2: Find the equation of the line passing through the point $(-4, -2)$ with slope $-\frac{2}{3}$. Write the equation in point slope form, slope intercept form, and standard form.

▼ Find the Equation of the line given two points on the line

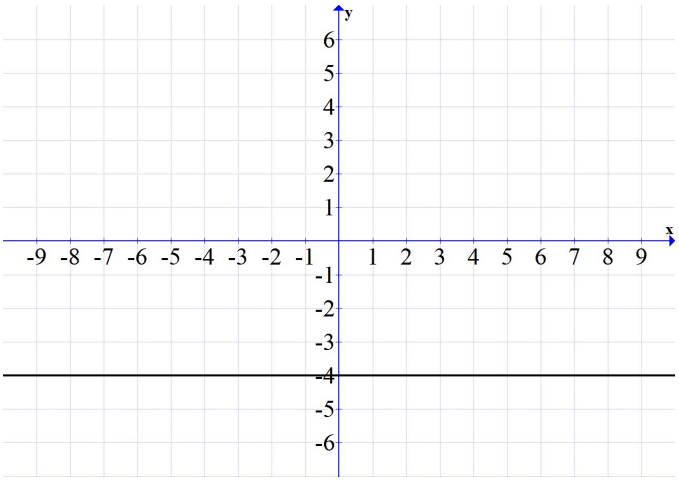
Example 1: Find the equation of the line passing through the point $(4, -3)$ and $(-2, 6)$. Write the equation in point slope form, slope intercept form, and standard form.

▼ Find the Equation of the line given the graph of the line

Example 1: Find the equation of the line given the graph of the line. Write the equation in slope intercept form.



Example 2: Find the equation of the line given the graph of the line.



Example : Find the equation of the line given the graph of the line.