Math 1300 Section 2.4

$y = 3x + 7$

$y = -\frac{1}{2}x + 3$

$y = 7x - 5$

Section 2.4: Graphing Lines

The graph of an equation of the form $y = Ax + B$ is a line.
If $A > 0$, then the graph will RISE as we move from left to the right.
If $A < 0$, then the graph will FALL as we move from left to the right.

Example 1: Graph the line $y = x - 1$

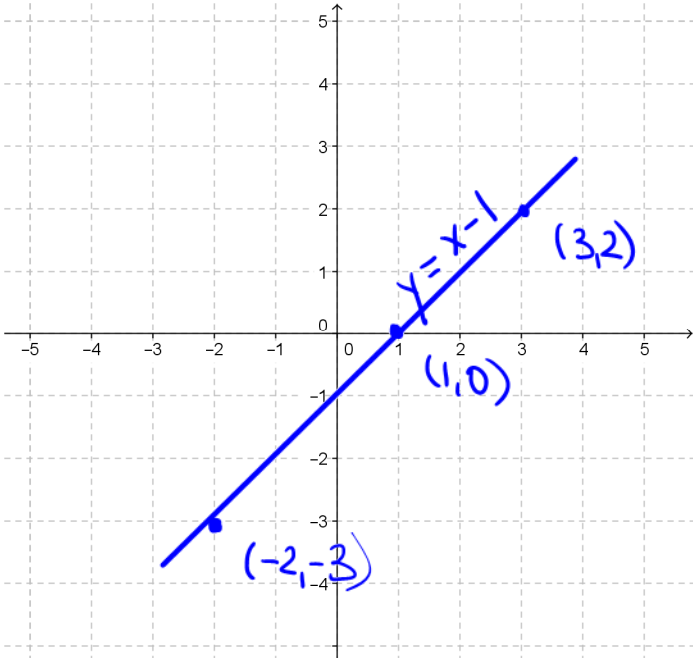
Start by filling in the missing values

x	y
-2	-3
1	0
3	2

$y = -2 - 1 = -3$

$y = 1 - 1 = 0$

$y = 3 - 1 = 2$

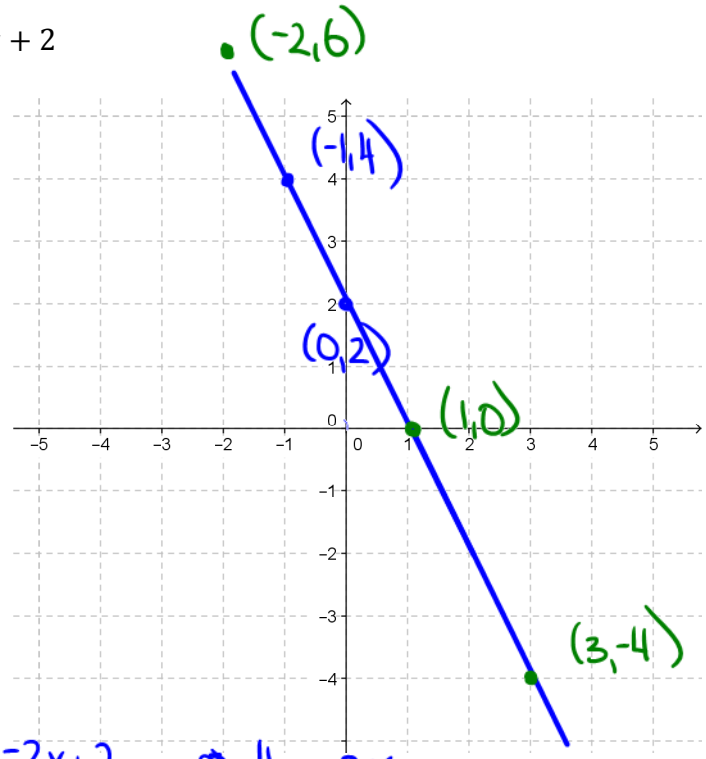


Math 1300 Section 2.4

Example 2: Graph the line $y = -2x + 2$

Start by filling in the missing values

x	y
-1	4
0	2
1	0
3	-4
-2	6



$y = -2(-1) + 2 = 2 + 2 = 4$

$y = -2(0) + 2 = 2$

$y = -2(1) + 2 = -2 + 2 = 0$

$-4 = -2x + 2$

$-2 \quad -2$

$\frac{-6}{-2} = \frac{-2x}{-2}$

$3 = x$

$6 = -2x + 2$

$-2 \quad -2$

$\frac{4}{-2} = \frac{-2x}{-2}$

$-2 = x$

Example 3: Fill in the table for $y = 3x - 6$

x	Y
-2	-12
0	-6
1	-3
5	9
2	0

$y = 3(-2) - 6 = -6 - 6 = -12$

$y = 3(0) - 6 = -6$

$y = 3(1) - 6 = 3 - 6 = -3$

$9 = 3x - 6$

$+6 \quad +6$

$\frac{15}{3} = \frac{3x}{3}$

$5 = x$

$x = 5$

$0 = 3x - 6$

$+6 \quad +6$

$\frac{6}{3} = \frac{3x}{3}$

$2 = x$

$x = 2$

Math 1300 Section 2.4

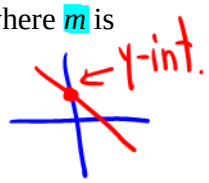
Equations of a Line

Forms of Equations:

1. The **standard form** of a linear equation is given by $Ax + By = C$ where A and B cannot both be equal to zero.
   Example: $2x - 4y = 12$

2. The **point-slope form** of a linear equation is given by $y - y_1 = m(x - x_1)$ where m is the slope and the line passes through the point (x_1, y_1).
   Example: $y + 3 = -2(x - 5)$ $m = -2$ $(5, -3)$
   $y - (-3)$

3. The **slope-intercept form** of a linear equation is given by $y = mx + b$ where m is the slope and b is the y-intercept.
   Example: $y = 2x + 1$ $m = 2$ $y\text{-int} = 1$



Example 4: Find an equation for the line with a slope of 4 and a y-intercept of 1.

$y = mx + b$

$y = 4x + 1$

Example 5: Find an equation for the line with a slope of -3 and a y-intercept of -2.

$y = mx + b$

$y = -3x - 2$

x_1, y_1

Example 6: Find an equation for the line with a slope of -5 and passing through the point (2, 8).

$y - y_1 = m(x - x_1)$ → $y = mx + b$

$y - 8 = -5(x - 2)$ → $y - 8 = -5x + 10$
$+8 \quad +8$

$y = -5x + 18$

x_1, y_1

Example 7: Find an equation for the line with a slope of 4/3 and passing through the point (6, 26).

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

$3(y - 26) = \frac{4}{3}(x - 6)$ $\quad 3y - 78 = 4(x - 6)$

$3y - 78 = 4x - 24$
$+78 \quad +78$

$\frac{3y}{3} = \frac{4x + 54}{3}$

$y - 26 = \frac{4}{3}(x - 6)$

point-slope form

$y = \frac{4}{3}x + 18$

slope-intercept form

Example 8: Find an equation in slope-intercept form for the line that passes through the points (-6, 2) and (0, -4).

x_1, y_1 x_2, y_2

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-4-2}{0-(-6)} = \frac{-6}{6} = -1$$

$$y - y_1 = m(x - x_1)$$
$$y - 2 = -1(x - (-6))$$
$$y - 2 = -1(x + 6)$$
$$y - 2 = -x - 6$$
$$+2 \qquad +2$$

$$\boxed{y = -x - 4}$$

Example 9: Find an equation in slope-intercept form for the line that passes through the points (-2, 2) and (4, -2).

x_1, y_1 x_2, y_2

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2-2}{4-(-2)} = \frac{-4}{4+2} = \frac{-4}{6} = -\frac{2}{3}$$

$$y - y_1 = m(x - x_1)$$
$$y - 2 = -\frac{2}{3}(x - (-2))$$
$$y - 2 = -\frac{2}{3}(x + 2)$$
$$+2 \qquad +2$$

$$y = -\frac{2}{3}(x+2) + 2$$
$$y = -\frac{2}{3}x - \frac{2}{3}\cdot 2 + 2$$
$$y = -\frac{2}{3}x - \frac{4}{3} + 2$$

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

$$-\frac{4}{3} + \frac{2 \cdot 3}{1 \cdot 3} = \frac{-4+6}{3} = \frac{2}{3}$$