Linear Functions

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A. Definitions

1. **linear function:** a function that forms a straight line when plotted on a graph.

Standard Form	Slope-Intercept Form
$Ax + By + C = 0$	$y = mx + b$

2. **x-intercept:** the point where the line crosses the x-axis (horizontal axis).

3. **y-intercept:** the point where the line crosses the y-axis (vertical axis).

B. Graphing a Linear Function

Method #1 – Table of Values Method

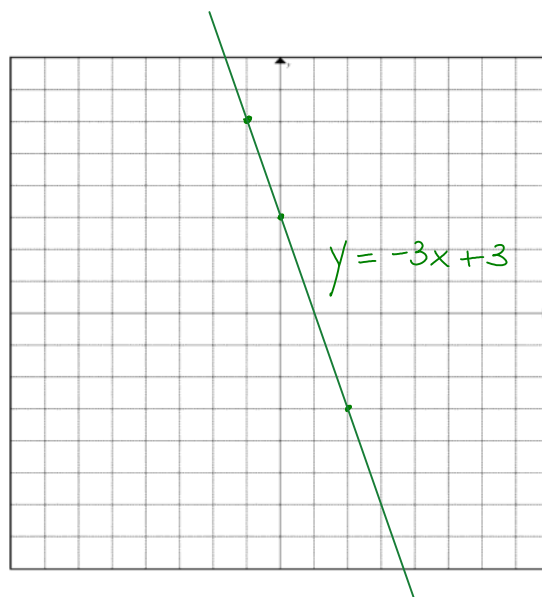Graph the linear function $3x + y - 3 = 0$

$3x + y - 3 = 0 \qquad -3x + 3$
$-3x \qquad \qquad -3 \quad -3$

$y = -3x + 3$

x	y	
0	3	$y = -3(0) + 3$
2	-3	$y = -3(2) + 3$
-1	6	$y = -3(-1) + 3$

$y = -3x + 3$

Method #2 – Slope-Intercept Method

Graph the linear equation $2x - 3y = 6$

$\dfrac{2x}{-2x} - 3y = \dfrac{6}{-2x}$

$\dfrac{-3y}{-3} = \dfrac{-2x}{-3} + \dfrac{6}{-3}$

$y = \dfrac{2}{3}x - 2$

$Slope = \dfrac{2}{3} \begin{smallmatrix} Rise \\ Run \end{smallmatrix}$ y-int $(0, -2)$

$y = \dfrac{2}{3}x - 2$
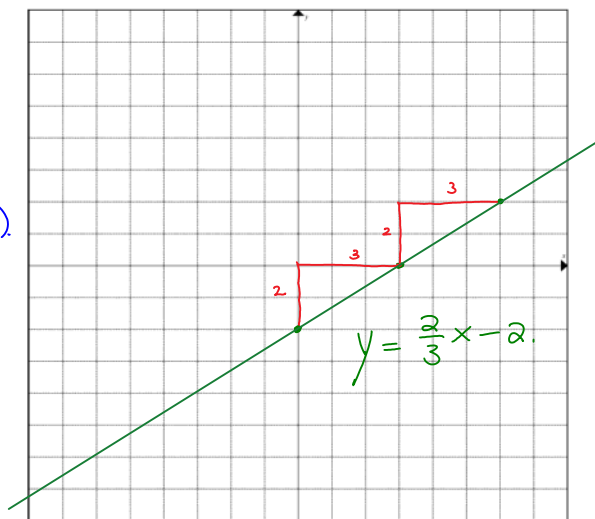
C. Determining the x & y intercepts of a Linear Function

The x & y intercepts can be found using two methods. If you have graphed the function then you may be able to determine the coordinates of the intercepts by looking closely at the graph. If you can't see the intercept points, or you have not graphed the function you can still determine the intercepts by using zero substitution.

1. Determine the x & y intercepts for the following linear functions.

a) $3x - 4y + 12 = 0$

x-int
$3x - 4y + 12 = 0$
$3x - 4(0) + 12 = 0$
$3x + 12 = 0 \atop -12 \quad -12$
$\dfrac{3x}{3} = \dfrac{-12}{3}$
$\boxed{X-int\ (-4, 0)}$

y-int
$3x - 4y + 12 = 0$
$3(0) - 4y + 12 = 0$
$-4y + 12 = 0 \atop -12 \quad -12$
$\dfrac{-4y}{-4} = \dfrac{-12}{-4}$
$\boxed{y-int\ (0, 3)}$

b) $y = -\dfrac{2}{3}x - 5$

X-int
$y = \dfrac{-2}{3}x - 5$
$3\left[(0) = \dfrac{-2}{3}x - 5\right]$
$0 = -2x - 15 \atop +15 \qquad +15$
$\dfrac{15}{-2} = \dfrac{-2x}{-2}$
$\boxed{X-int\ \left(\dfrac{-15}{2}, 0\right)}$

y-int
$y = \dfrac{-2}{3} \times \boxed{-5}$
$\boxed{y-int\ (0, -5)}$

Assignment: Graphing Linear Functions Assignment #1 – 12

Graph the following linear equations. Make sure to make a table of values with at least $\underline{3}$ acceptable points. Then determine the coordinates of the x-intercept & y-intercept.

1. $3x + y = -2$

2. $4x + 2y = 6$

3. $x + 2y = 2$

4. $y = \dfrac{2}{3}x - 5$

5. $3x - 2y = 10$

6. $y = 3x$

7. $x + 2y = -4$

8. $2x + 5y = 10$

9. $2x - y = 0$

10. $-x + y = -3$

11. $y = -3x + 1$

12. $8x - 4y = -12$

Answers

1) $x - \text{int}(-\frac{2}{3}, 0)$, $y - \text{int}(0, -2)$ 2) $x - \text{int}(\frac{3}{2}, 0)$, $y - \text{int}(0, 3)$

3) $x - \text{int}(2, 0)$, $y - \text{int}(0, 1)$ 4) $x - \text{int}(\frac{15}{2}, 0)$, $y - \text{int}(0, -5)$

5) $x - \text{int}(\frac{10}{3}, 0)$, $y - \text{int}(0, -5)$ 6) $x - \text{int}(0, 0)$, $y - \text{int}(0, 0)$

7) $x - \text{int}(-4, 0)$, $y - \text{int}(0, -2)$ 8) $x - \text{int}(5, 0)$, $y - \text{int}(0, 2)$

9) $x - \text{int}(0, 0)$, $y - \text{int}(0, 0)$ 10) $x - \text{int}(3, 0)$, $y - \text{int}(0, -3)$

11) $x - \text{int}(\frac{1}{3}, 0)$, $y - \text{int}(0, 1)$ 12) $x - \text{int}(-\frac{3}{2}, 0)$, $y - \text{int}(0, 3)$