## 5.5 Graphing Linear Relationships

### Review: Isolating a variable

**Example 1:** Isolate the dependent variable ( $y$ )

a) $4x + y = 3$

$-4x \quad -4x$

$y = 3 - 4x$

or

$y = -4x + 3$

b) $-2x + 3y = 6$

$+2x \quad +2x$

$\frac{3y}{3} = \frac{6}{3} + \frac{2x}{3}$

$y = 2 + \frac{2}{3}x$ or $y = \frac{2}{3}x + 2$

c) $-x - 3y = 6$

$+x \quad +x$

$\frac{-3y}{-3} = \frac{6}{-3} + \frac{x}{-3}$

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

d) $-2x + 5y + 10 = 0$

$+2x \quad -10 \quad +2x \quad -10$

$\frac{5y}{5} = \frac{2x}{5} - \frac{10}{5}$

$y = \frac{2}{5}x - 2$ or $y = -2 + \frac{2}{5}x$

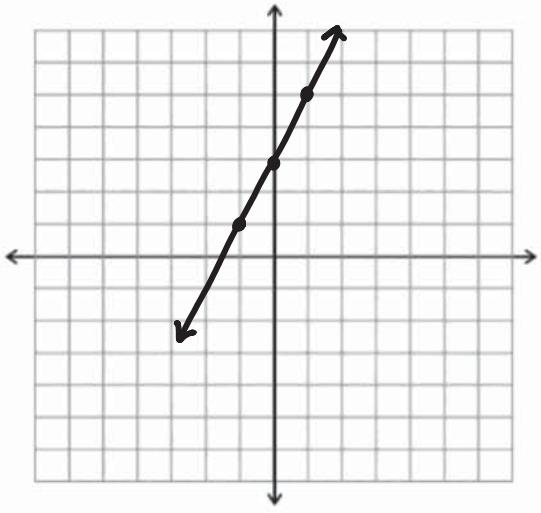
### Graphical Representation: Using a Table of Values

* use at least 3 points
  1 positive, 1 negative, zero
* join points and extend line in both directions

**Example 2**: Graph the following linear function by completing a table of values.

a) $y = 2x + 3$

| x | y |
|---|---|
| -1 | $y = 2(-1) + 3 = -2 + 3 = 1$ |
| 0 | $y = 2(0) + 3 = 0 + 3 = 3$ |
| 1 | $y = 2(1) + 3 = 2 + 3 = 5$ |

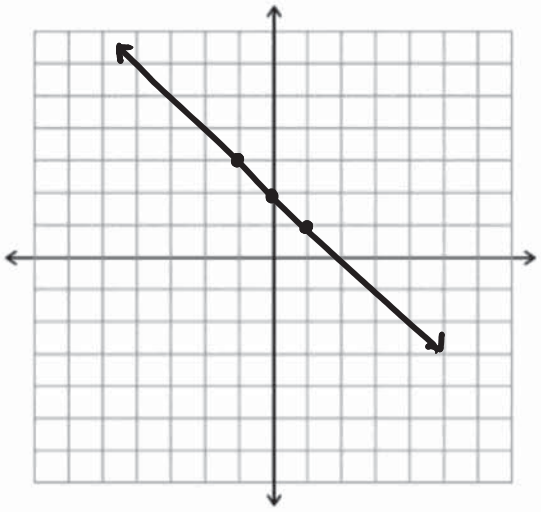


b) $y + x = 2$ } isolate "y" first

$-x \quad -x$

$y = 2 - x$ or $y = -x + 2$

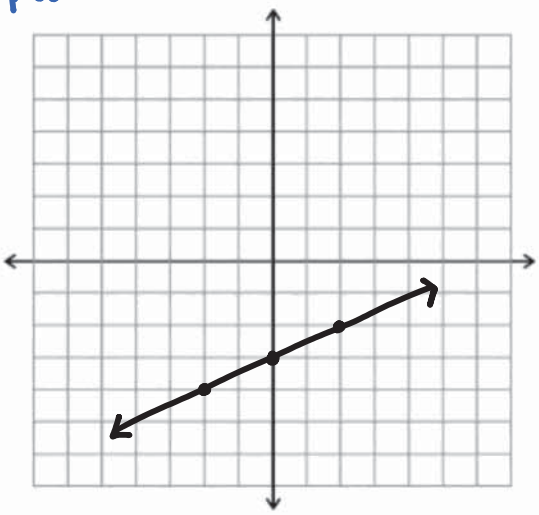
| x | y |
|---|---|
| -1 | $y = -(-1) + 2 = 1 + 2 = 3$ |
| 0 | $y = -(0) + 2 = 2$ |
| 1 | $y = -(1) + 2 = -1 + 2 = 1$ |



c) $\frac{2y}{2} = \frac{x}{2} - \frac{6}{2}$ } isolate "y" first

$y = \frac{1}{2}x - 3$ ← choose "x" values that are multiples of the denominator

| x | y |
|---|---|
| -2 | $y = \frac{1}{2}(-2) - 3 = -1 - 3 = -4$ |
| 0 | $y = \frac{1}{2}(0) - 3 = 0 - 3 = -3$ |
| 2 | $y = \frac{1}{2}(2) - 3 = 1 - 3 = -2$ |



## Finding "$x$" and "$y$" intercepts

**"$x$" intercept** – the point on the $x$-axis in which the graph crosses or intercepts.

All along the $x$-axis the "$y$" co-ordinate is equal to **zero**. So, we say that there is a "$x$" intercept when $y = 0$. **(x, 0)**

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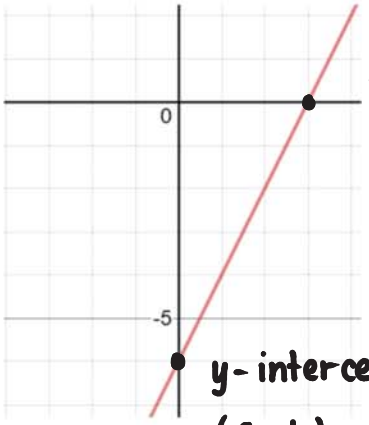
**(0, y)**




x-intercept
(3,0) or x = 3

y-intercept
(0,-6) or y = -6

**Example:** Find the $x$ and $y$ intercepts and then use them to graph the following linear function.

a) $2x + 4y = 8$

$x$ - intercept → value of x when y = 0

$2x + 4(0) = 8$

$\frac{2x}{2} = \frac{8}{2}$

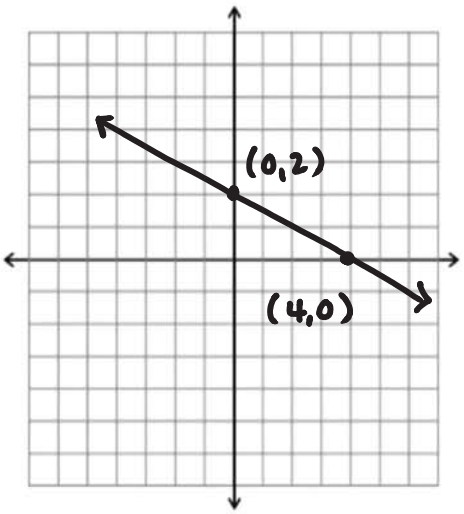
$x = 4$ x-intercept (4,0)

$y$ - intercept → value of y when x = 0

$2(0) + 4y = 8$

$\frac{4y}{4} = \frac{8}{4}$

$y = 2$ y-intercept (0,2)




We can joint the 2 intercepts to form our line.

c) $3x - 6y = 12$

$x$ - intercept

$x = ?$ when $y = 0$

$3x - 6(0) = 12$

$\frac{3x}{3} = \frac{12}{3}$ $\quad x = 4 \quad (4,0)$

$y$ - intercept

$y = ?$ when $x = 0$

$3(0) - 6y = 12$

$\frac{-6y}{-6} = \frac{12}{-6}$

$y = -2 \quad (0,-2)$