

Lesson 7: General Form of the Equation $ax + by + c = 0$

Linear Relations can be written in several ways. We have already looked at slope-intercept ($y = mx + b$) and point-slope form ($y - y_1 = m(x - x_1)$).

Two other forms are possible:

Standard Form: $ax + by = c$ (where a,b,c are integers)

General Form: $ax + by + c = 0$ (where a is a whole number and b,c are integers)

These are just manipulations of the equations we have already looked at!

We can graph both forms of these equations, by finding x and y intercepts.

Example 1: Graph $2x + 3y - 12 = 0$

x	y
0	4
6	0

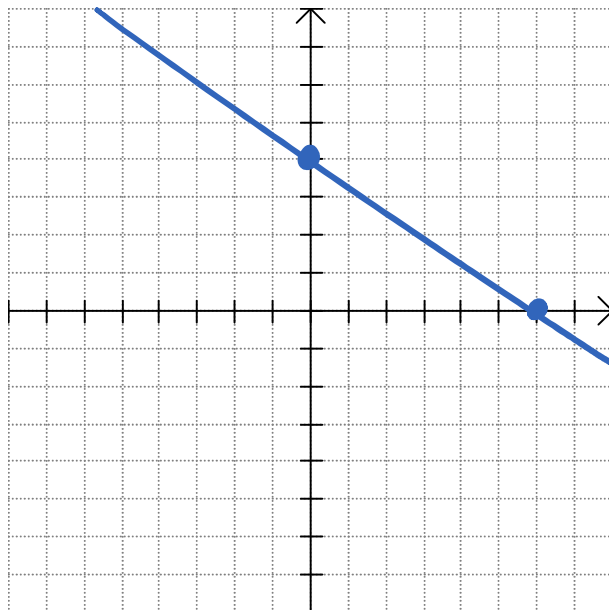
$$\cancel{2(0)} + 3y - 12 = 0$$

$$3y - 12 = 0$$

+12 +12

$$\frac{3y}{3} = \frac{12}{3}$$

$$y = 4$$



$$2x + \cancel{3(0)} - 12 = 0$$

$$2x - 12 = 0$$

+12 +12

$$\frac{2x}{2} = \frac{12}{2}$$

$$x = 6$$

Example 2: The equation $4x - 3y + 15 = 0$ is a line. Determine the slope and y-intercept. $y = mx + b$

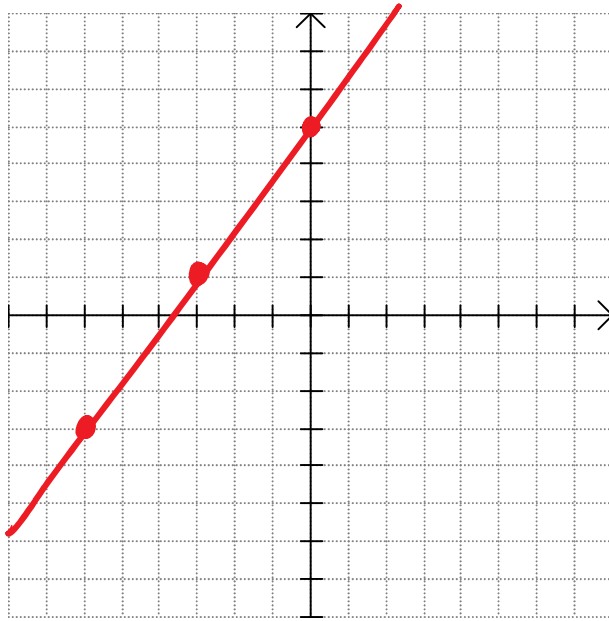
$$4x - 3y + 15 = 0$$

$$+3y \quad +3y$$

$$\frac{4x + 15}{3} = \frac{3y}{3}$$

$$\frac{4x}{3} + 5 = y$$

$$m = \frac{4}{3}, b = 5$$



Example 3: Write the equation in general form: $y = -\frac{1}{2}x + 3$ $ax + by + c = 0$

$$(2)y = (2)\left(-\frac{1}{2}x\right) + 2(3)$$

$$+x - 6 \quad 2y = -x + 6$$

$$+x - 6$$

$$x + 2y - 6 = 0$$

Example 4: Write the equation in slope-intercept form:

$$5x + 2y + 6 = 0$$

$$-5x \quad -5x$$

$$y = mx + b$$

$$2y + 6 = -5x - 6$$

$$-6$$

$$\frac{2y}{2} = \frac{-5x - 6}{2} \quad y = -\frac{5}{2}x - 3$$

Example 5: Write a linear equation for the following situation:
Joshua has loonies and toonies. Altogether he has \$27.

$$x = \text{loonies } (\$1.00)$$

$$y = \text{toonies } (\$2.00)$$

$$x + 2y = 27$$

$$x + 2y - 27 = 0$$

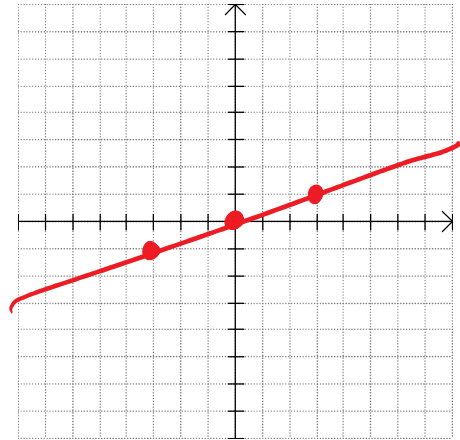
Special Case Lines:

1. $x - 3y = 0$

$+3y +3y$

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

$y = \frac{1}{3}x$



**If the constant is missing then the y-int = 0 **

2. $2y + 4 = 0$

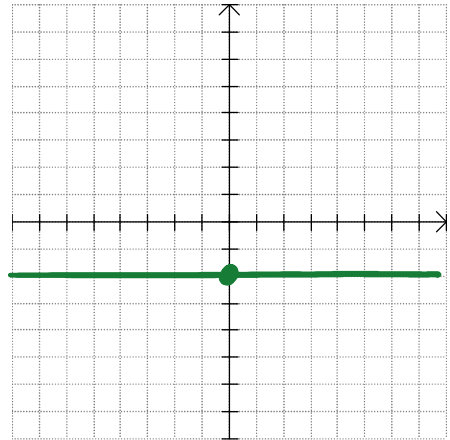
$-4 -4$

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

$y = -2$

$y = 0x - 2$

← zero slope



**If the equation is $y = \#$ then the line is horizontal

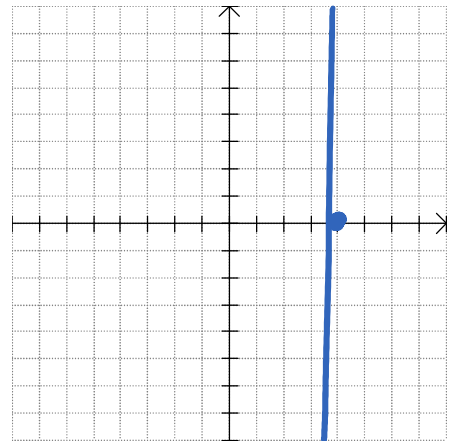
3. $3x - 12 = 0$

$+12 +12$

$\frac{3x}{3} = \frac{12}{3}$

$x = 4$

*undefined slope.



**If the equation is $x = \#$ then the line is vertical **

page 384 #4,5ac,6ac,8a,12ac,13,18,28