

Equation of a Line in General Form

Goal:

- to write the equation of a line in general form
- to find the slope and intercepts from the general form
- to convert between function and general form

We have seen that $y=ax+b$ is called the function form of the equation of a line.

What could other forms look like?

$$b = y - ax$$

$$ax = y - b$$

$$x = \frac{y-b}{a} = \frac{y}{a} - \frac{b}{a}$$

We can write the equation in many different ways

The general form of the equation of a line is represented as:

$$Ax + By + C = 0$$

A, B, C are integers (not fractions) ↑ key characteristic of general form

In this form, the slope and intercepts can be found by solving or by applying the following formulas:

- to solve for x-int, make $y = 0$
 - to solve for y-int, make $x = 0$
- this process gives formulas:

$$\text{x-int} = \frac{-C}{A}$$

$$\text{y-int} = \frac{-C}{B}$$

$$\text{slope} = \frac{-A}{B}$$

Ex: a) Find the equation of a line in general form that has an x-intercept at $x=3$ and a y-intercept at $y=-6$.

1. Find the equation in function form:

$$y = ax + b \quad a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - (-6)}{3 - 0} = \frac{6}{3} = 2$$

$$y = 2x + b \quad \text{plug in point}$$

$$0 = 2(3) + b$$

$$0 = 6 + b \quad y = 2x - 6$$

$$-6 = b$$

2. Switch the equation to general form

$$y = 2x - 6$$

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

rewrite equation
equal zero
(move "y" to
other side)

b) Find the equation a line in general form that has a slope of -3 and passes through $(-1, 5)$.

$$y = ax + b \quad a = -3$$

$$y = -3x + b \quad \text{plug in } (-1, 5)$$

$$5 = -3(-1) + b$$

$$5 = 3 + b$$

$$2 = b$$

$$y = -3x + 2$$

$$0 = -3x - y + 2 \quad \text{o.k.}$$

$$3x + y - 2 = 0$$

better
(coefficient on
"x" should be
positive)

Convert: and identify x-int, y-int and slope

a) $y = \frac{1}{2}x - 5$ to general form

$$y = \frac{1}{2}x - 5$$

$$0 = \left(\frac{1}{2}x - y - 5\right) \times 2$$

$$0 = x - 2y - 10$$

$$\text{slope} = a = \frac{1}{2}$$

$$y\text{-int} = b = -5$$

$$x\text{-int} = \frac{-C}{A} = \frac{-(-10)}{1} = 10$$

b) $3x - 4y + 8 = 0$ to function form

Method 1: Use formulas

$$\text{slope} = \frac{-A}{B} \quad x\text{-int} = \frac{-C}{A}$$

$$\text{slope} = \frac{-(3)}{-4} = \frac{3}{4}$$

$$y\text{-int} = \frac{-C}{B}$$

$$y\text{-int} = \frac{-(8)}{-4} = 2$$

$$x\text{-int} = \frac{-8}{3}$$

$$y = \frac{3}{4}x + 2$$

Homework : p.28 #2 part 2, 3, 6, 15
