

SECTION 3.2: Graphing Equations (p. 181 - 193)

- Function notation $y = f(x)$ (p. 515)
- ordered pair: first coordinate and second coordinate (p. 171)
- plot pairs of numbers (p. 171)
- 1st coordinate axis for input (x - axis) (p. 171)
- 2nd coordinate axis for output (y - axis) (p. 171)
- To graph a function $f(x)$ (p. 183)
- Graphing equations using the TI-84 Calculator (p. 184 - 185)

Function notation:

$$f(x) = \underbrace{-2x - 3}_{\text{output}}$$

↑
input

Forward problem: function evaluation to find outputs

Given a function and an input value, find the corresponding output.

1. Evaluate each of the following functions at the given input.

A. Let $f(x) = -2x - 3$. Find $f(-4)$

$$\begin{aligned} \text{Input } x = -4 &\Rightarrow f(-4) = -2 \cdot (-4) - 3 \\ &= 8 - 3 \\ &= \boxed{5} \end{aligned}$$

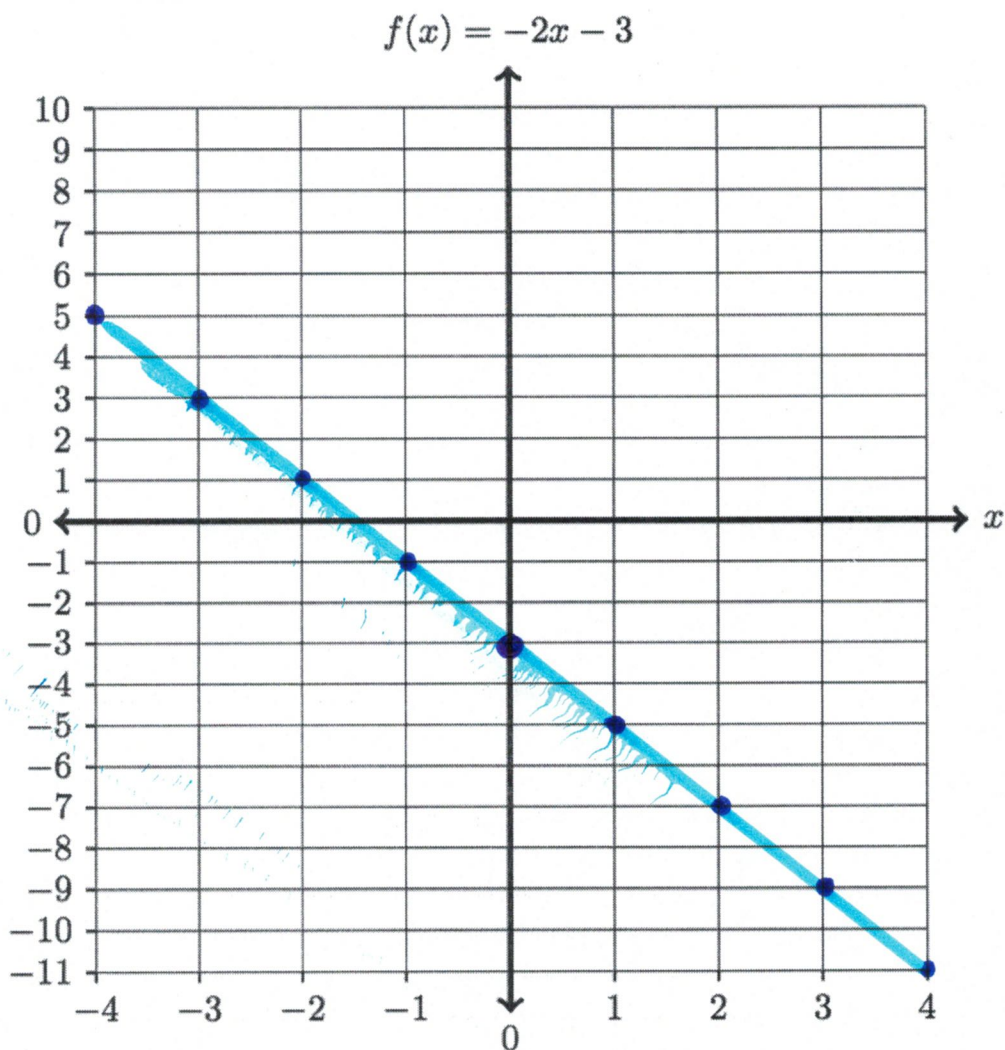
B. Let $f(x) = -2x - 3$. Find $f(4)$

$$\begin{aligned} \text{Input } x = 4 &\Rightarrow f(4) = -2(4) - 3 \\ &= -8 - 3 \\ &= \boxed{-11} \end{aligned}$$

2. Forward Problem: Linear Function Evaluation

- A. Fill in the tables below
 B. Plot these points on the axis provided.
 C. Interpolate between the points you plotted to create the graph of this function.

x	$f(x) = -2x - 3$
-4	5
-3	3
-2	1
-1	-1
0	-3
1	-5
2	-7
3	-9
4	-11



→ this corresponds to the ordered pair

input: $(4, -11)$
 ↑ 1st coordinate ↓ output: 2nd coordinate

3. What is the y -intercept of this line?

where line crosses the y -axis

at the point

$(0, -3)$ with

4. What is the slope of this line?

The slope of this line is

$$m = \frac{\text{rise}}{\text{run}} = \frac{-2}{1} = -2$$

Algebraic Technique to solve algebraic equations

To find the solution of an algebraic equation using an algebraic method, isolate the unknown variable by using inverse operations.

5A. Solve the equation $-2x - 3 = \frac{1}{2}x + 2$ using an algebraic technique. Show your steps.

We will solve this equation by getting all variables on one side:

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

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

$$\Rightarrow -5 = \frac{1}{2}x + \frac{2}{1}x$$

$$\Rightarrow -5 = \frac{x}{2} + \frac{4x}{2} = \frac{5x}{2}$$

$$\Rightarrow x = -\frac{5}{1} \cdot \frac{2}{5} = -2 \Rightarrow \boxed{x = -2}$$

5B. Resolve the equation $-2x - 3 = \frac{1}{2}x + 2$ using an algebraic technique. However, this time try to solve this equation in a different way than you did in problem 5

$$-2x - 3 = \frac{1}{2}x + 2 \Rightarrow -2x - 5 = \frac{1}{2}x$$

$$\Rightarrow x = 2 \cdot (-2x - 5)$$

$$\Rightarrow x = -4x - 10$$

$$\Rightarrow 5x = -10$$

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

$$\Rightarrow \boxed{x = -2}$$

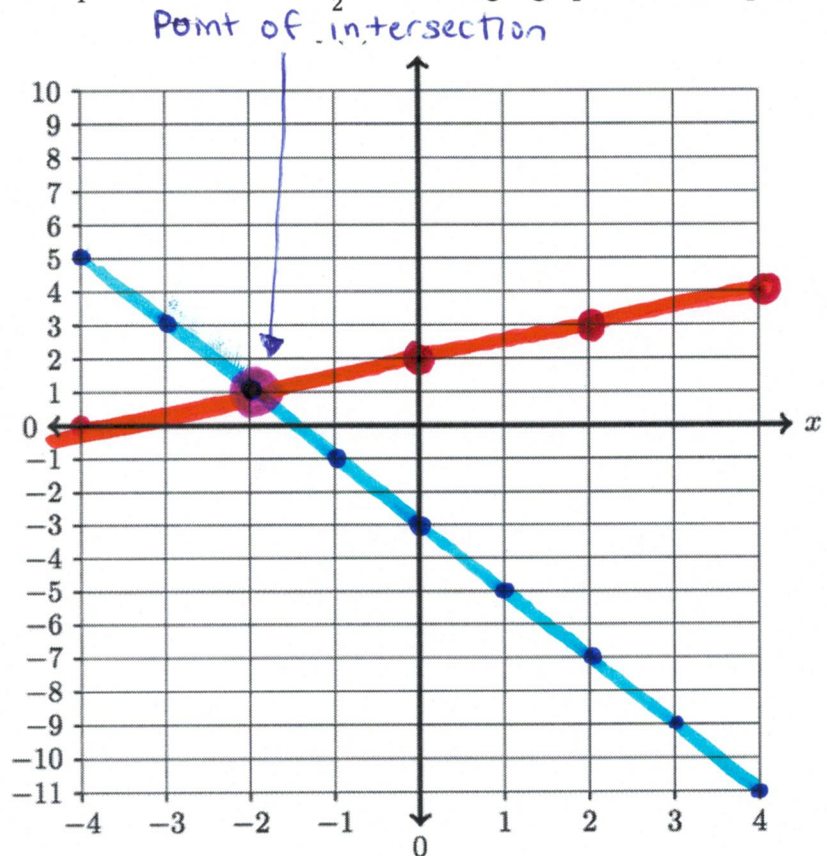
Graphical Technique to solve algebraic equations

To find the solution to algebraic equations using a graphical technique,

- Step 1: Identify and graph the function on the left-hand side of the equals sign.
 Step 2: Identify the function on the right-hand side of the equals sign and graph this function on the same axis you used in step 1.
 Step 3: Find the point(s) of intersection between the graphs of the two functions.
 Step 4: Identify the 1st coordinate (the "x" value) of the points of intersection.
 Step 5: The 1st coordinate(s) represent the solution(s) to the algebraic equation

- 6A. Complete the 5 steps outlined above to solve the equation $-2x - 3 = \frac{1}{2}x + 2$ using a graphical technique.

x	Left-hand side: $y_1 = -2x - 3$	Right-hand side: $y_2 = \frac{1}{2}x + 2$
-4	5	0
-3	3	0.5
-2	1	1
-1	-1	1.5
0	-3	2
1	-5	2.5
2	-7	3
3	-9	3.5
4	-11	4



- 6B. At what point do the two graphs above intersect? Specifically identify this point on the graph and write it as an ordered pair below.

Point of intersection at

$(-2, 1)$
 ↑
 x-coordinate

- 6C. Based this graphical technique, what is the solution to the equation $-2x - 3 = \frac{1}{2}x + 2$?

$x = -2$

7. What do you notice about the solutions you found in problems 5A and 5B and the solution you found in 6C?

The solutions produced by the algebraic techniques are the same as the solutions produced by the graphical techniques.