

Math 48A, Lesson 4: Read Graphs to Solve Equations

1. EVALUATE LINEAR FUNCTIONS

Recall our discussion of function notation:

$$f(x) = -2x - 3$$

↑
output

input

1. Let $f(x) = -2x - 3$. Evaluate each of the following:

$f(-4)$,

$f(-\frac{1}{2})$,

$f(\frac{1}{2})$,

and

$f(4)$

Input:

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

$$\boxed{f(-\frac{1}{2}) = -2}$$

evaluation
bar

Output:

$$f(-\frac{1}{2}) = (-2x - 3) \Big|_{x = -\frac{1}{2}}$$

$$= -2(-\frac{1}{2}) - 3$$

multiplication

$$= \boxed{-2} \cdot \boxed{\frac{-1}{2}} - 3$$

fraction

$$= \frac{-2}{1} \cdot \frac{-1}{2} - 3$$

fraction fraction

multiplication

$$= \frac{-2 \cdot -1}{1 \cdot 2} - 3$$

$$= \frac{2}{2} - 3$$

$$= 1 - 3$$

$$= -2$$

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.

2. Solve the equation $-2x - 3 = \frac{1}{2}x + 2$ using an algebraic technique. Show your steps. If possible, please solve this equation in more than one way.

Linear equation: $-2x - 3 = \frac{1}{2}x + 2$

ouch... let's annihilate this first

anything I do to RHS, I gotta do to LHS

$$\Rightarrow -2x - 3 \neq \frac{2}{1} \cdot \left(\frac{1}{2}x + 2 \right)$$

multiply to every value (distributivity)

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

$$\Rightarrow -2x - 3 \neq x + 2 \cdot 2$$

$$\Rightarrow \begin{array}{r} -2x - 3 \\ +2x \\ \hline \end{array} \neq \begin{array}{r} x + 4 \\ +2x \\ \hline \end{array}$$

Cancel

$$\Rightarrow -3 \neq 3x$$

CORRECT MV MISTAKE:

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

distribute

$$\begin{array}{r} -4x - 6 \\ +4x \\ \hline \end{array} = \begin{array}{r} x + 4 \\ +4x \\ \hline \end{array}$$

Cancel

$$\begin{array}{r} -6 \\ -4 \\ \hline \end{array} = \begin{array}{r} 5x + 4 \\ -4 \\ \hline \end{array}$$

Cancel

$$-10 = 5x$$

Famous Algebra Tricks

$$\square \quad \boxed{\frac{A}{B}} \cdot \boxed{\frac{C}{D}} = \frac{A \cdot C}{B \cdot D} = \frac{AC}{BD}$$

fraction

fraction

multiplication

they make a bond
(multiplication bond
on top and
on bottom)

When multiplying two fraction,

they come together

and divide

$$\square \quad \boxed{\frac{A}{B}} \div \boxed{\frac{C}{D}} = \boxed{\frac{A}{B}} \cdot \boxed{\frac{D}{C}} = \frac{A \cdot D}{B \cdot C}$$

fraction

fraction

divide

$$\square \quad \text{Division by 1: } A = \frac{A}{1}$$

(division by 1 doesn't
change anything)

$$\boxed{\frac{2}{1}} \cdot \boxed{\frac{1}{2}} = \frac{2 \cdot 1}{1 \cdot 2} = \frac{2}{2} = 1$$

fraction

fraction

multiplication

- When multiplying two numbers together, remember sign matters

Sign of one number

Sign of other number

	+	-
+	+	-
-	-	+

- $\frac{A}{A} = 1$ if $A \neq 0$

↑ any nonzero number divided by itself is zero