

Learning Target: I can represent a relationship between numbers and variables in multiple forms using graphs, rules, words, and tables.

RELATIONS

Relations are given values, known as inputs and outputs. There are 3 main parts:

- Input value (x)
- Relationship (*rule or expression*)
- Output value (y)

Example 1:

Input x	Relationship	Output y
-5	+ 2	-3
-3	+ 2	-1
-2	+ 2	0
0	+ 2	2
2	+ 2	4

How could we express the relationship as an algebraic equation?

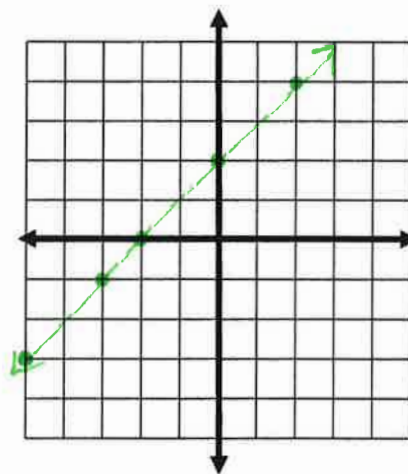
$$x + 2 = y$$

True or False: The output values are dependent upon the input values?

True, x determines y .

Because the input and output values represent values of x and y , we can graph the relationship on the coordinate plane system.

Input (x)	Output (y)	Ordered pair (x, y)
-5	-3	-5, -3
-3	-1	-3, -1
-2	0	-2, 0
0	2	0, 2
2	4	2, 4

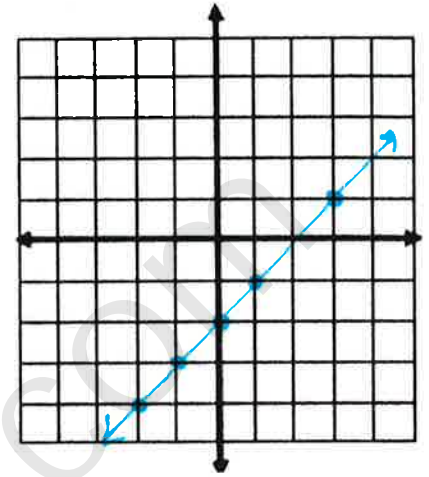


Example 2:

Complete a function table for the equation $y=x-2$

- Step 1: Substitute the input value for x in the equation
- Step 2: Solve for the output value, y
- Step 3: Determine the ordered pairs
- Step 4: Graph

Input x	Function	Output y	Ordered Pair (x, y)
3	$3-2=$	1	3, 1
1	$1-2$	-1	1, -1
0	$0-2$	-2	0, -2
-1	$-1-2$	-3	-1, -3
-2	$-2-2$	-4	-2, -4



FUNCTIONS

ALL functions are relations; however, *NOT* all relations are functions.

A **function** is a special relation in which each member of the **domain (x-values)** is paired with EXACTLY ONE member in the **range (y-values)**.

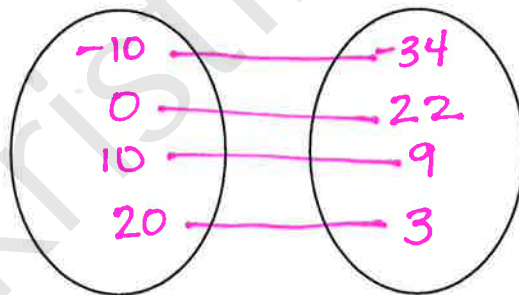
Example 3:

Is the following relation a function? Explain.

$\{(-10, -34), (0, 22), (10, 9), (20, 3)\}$

Domain

Range



Step 1: Create a function table

Step 2: Determine if each member of the domain is paired with one and only one member in the range.

- If **YES** - The relation is a **Function**
- If **NO** - The relation is **not a function**

yes, each x has only 1 y

Example 4:

Is the following relation a function? Explain.

x	-10	-10	10	20
y	-34	-22	-9	3



NO, because -10 (x) maps to both -34 + -22
1 x has 2 y 's \therefore Not Func.

Example 5:

Given the following set, find the domain and range.

$$\{(5, 2), (8, 3), (2, 9), (12, 0)\}$$

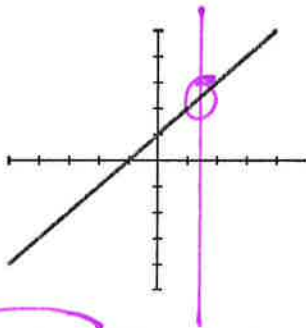
$$D: 5, 8, 2, 12$$

$$R: 2, 3, 9, 0$$

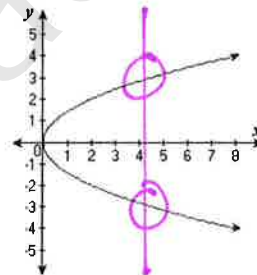
Another method used to determine if a relation is a function is the **vertical line test**.

Vertical Line Test	<ul style="list-style-type: none">• Move a straight edge (ruler) vertically across the graph of a relation.• If it passes through ONLY ONE POINT on the graph, the graph represents a function.• If it passes through MORE THAN ONE POINT, the graph does NOT represent a function.
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Example 6:

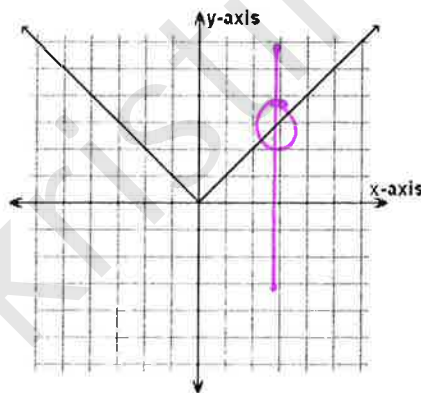


Function OR Not a Function

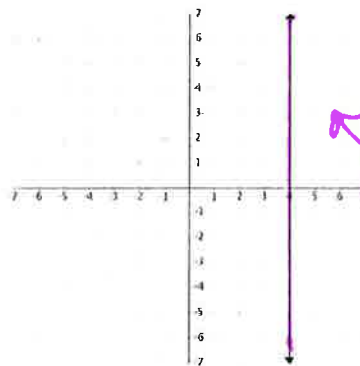


2 intersection points

Function OR Not a Function



Function OR Not a Function



intersects at all points

Function OR Not a Function

FUNCTION RULES

Functions, like sequences have rule. The rule may be arithmetic, geometric, or a combination of both.

Example 7: Given the function tables below, determine the rule, then write an equation that describes the input and output values in terms of x and y .

Input	Output
-2	3
-1	4
0	5
1	6
3	8

→ Always look to 0 first ←

Equation
 $y = 1x + 5$

determine by taking diff. of y values that are in consecutive order

determine by looking at zero.

Input	Output
-2	-3
-1	-1
0	1
1	3
3	7

Equation
 $y = 2x + 1$

Input	Output
-2	-5
-1	-4
0	-3
1	-2
3	0

Equation
 $y = x - 3$

If x 's don't skip #'s (are consecutive) you can determine coefficient on x

+2
+2
+2

Be aware of skipping #'s - trick to find coefficient on x won't work if this is always the case