UNIT 4 DAY 5 - 10/16

Common Core Math I Warm Up Unit 3

Find the first five terms for each recursive sequence.

1) START = -2
NEXT = NOW +7 ← ARITHMETIC SEQUENCE
-2, 5, 12, 19, 26

2) START = 1
NEXT = NOW *3 ← GEOMETRIC SEQUENCE
1, 3, 9, 27, 81

3) START = 6
NEXT = NOW*2 + 4
6, 16, 36, 76, 156

Fill in the tables below for each INPUT-OUTPUT rule.

4) OUTPUT = INPUT*7 + -2 ← LINEAR FUNCTION

INPUT	OUTPUT
0	-2
1	5
2	12
3	19
4	26

5) OUTPUT = 3^{INPUT} ← EXPONENTIAL FUNCTION

INPUT	OUTPUT
0	1
1	3
2	9
3	27
4	81

6) OUTPUT = INPUT*2 + 4

INPUT	OUTPUT
0	4
1	6
2	8
3	10
4	12

Compare the NOW-NEXT and INPUT-OUTPUT rules. What do you notice?

Testing for Functions

In this lesson you will
- represent relationships with tables, graphs, and equations
- use the **vertical line test** to determine whether a relationship is a function

You have written and used many rules that transform one number into another. For example, one simple rule is "Multiply each number by 2."You can represent this rule with a table, an equation, a graph, or a diagram.

Table

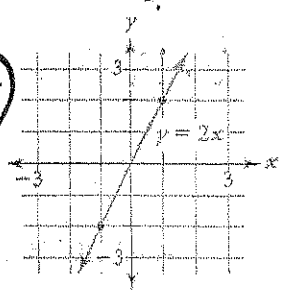
Input x	Output y
3	6
−14	−28
9.3	18.6
x	$2x$

Equation

$y = 2x$

output = 2 (input)

Graph



Diagram

Domain Range

3 → 6

−14 → −28

9.3 → 18.6

In this lesson you will learn a method for determining whether a rule is a function either by applying the definition of function to graphs and tables.

Vocabulary:

Relation: A LIST OF ORDERED PAIRS

Ex: (1, 2) (2, -2) (3, -4)

Function: A RELATION WHERE EACH INPUT (X-VALUES) HAS EXACTLY ONE OUTPUT (Y-VALUES)

Domain: INPUT (X-VALUES)

Range: OUTPUT (Y-VALUES)

Investigation: Testing for Functions

In this investigation we will look at different representations of relationships - tables, algebraic statements (equations or inequalities), and graphs. In each case, we will decide whether the relationship represented is a function or not.

Part I: Tables

Determine whether each table is a function or not. Explain.

Table 1

x	y
1	-2
2	1
4	7
7	16
10	25

Table 2

x	y
1	-1
1	1
4	2
4	-2
9	3

Table 3

x	y
-2	4
-1	1
0	0
1	1
2	4

Table 4

x	y
2	-4
1	-1
0	0
1	1
2	4

Table 1 (Function) / Not a Function Explain: EACH INPUT HAS ONLY ONE OUTPUT

Table 2: Function / (Not a Function) Explain: INPUT OF 1 HAS AN OUTPUT OF -1 & 1
" 4 " " OF 2 & -2

Table 3 (Function) / Not a Function Explain: _____

Table 4: Function / (Not a Function) Explain: INPUT OF 2 HAS AN OUTPUT OF -4 & 4
" 1 HAS AN OUTPUT OF -1 & 1

Part II: Equations

Determine whether each equation is a function or not. Explain.

Equation 1	Equation 2	Equation 3	Equation 4
$y = 2x + 1$	$y = \sqrt{x}$ = 2 =-2	$y = x^2$	$y < -2x + 4$

Equation 1 (Function) / Not a Function Explain: ONLY ONE OUTPUT FOR EACH INPUT

Equation 2: Function / (Not a Function) Explain: TWO POSSIBLE OUTPUTS FOR 1 INPUT

Equation 3 (Function) / Not a Function Explain: ONLY ONE SOLUTION FOR EACH INPUT

Equation 4: Function / (Not a Function) Explain: MORE THAN ONE SOLUTION

$y < -2(1) + 4$

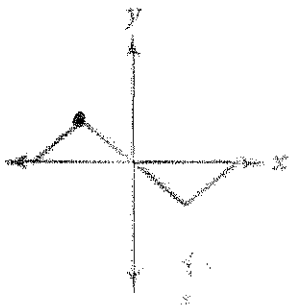
$y < 2$

Adapted from *Discovering Algebra: An Investigative Approach* by Murdock, Kamischke, and Kamischke

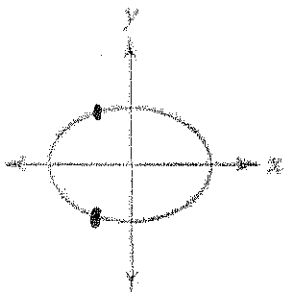
Part III: Graphs

Determine whether each graph is a function or not. Explain.

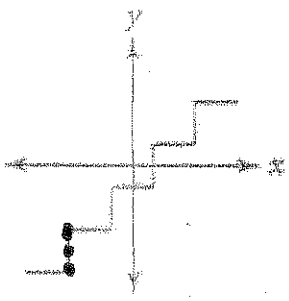
Graph 1



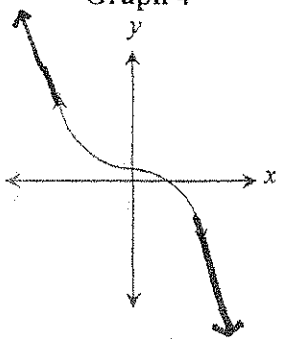
Graph 2



Graph 3



Graph 4



You can move a vertical line, such as the edge of a ruler, from left to right on a graph to determine whether the graph represents a function. If the vertical line ever touches the graph in more than 1 place you know that there is an x-value that has more than one corresponding y value, so the graph is NOT a function. This is called the vertical line test.

Graph 1: (Function) / Not a Function Explain: _____

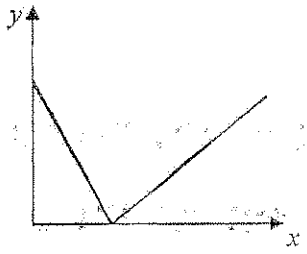
Graph 2: Function / (Not a Function) Explain: _____

Graph 3: Function / (Not a Function) Explain: _____

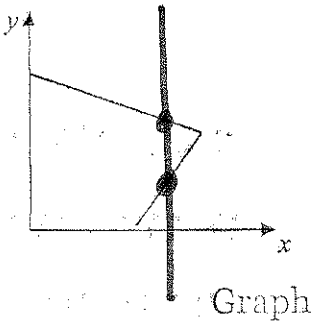
Graph 4: (Function) / Not a Function Explain: _____

EXAMPLE 1 Use the vertical line test to determine which relationships are functions.

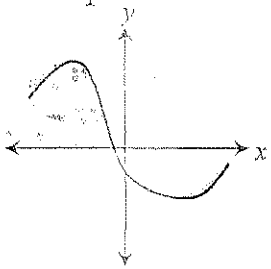
Graph A



Graph B



Graph C



Graph A: (Y) / N

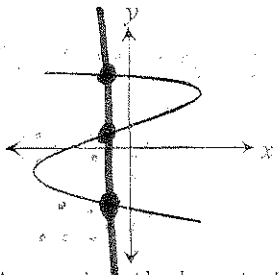
Graph B: Y / (N)

Graph C: (Y) / N

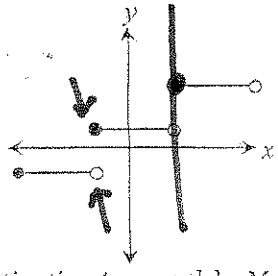
Graph D: Y / (N)

Graph E: (Y) / N

Graph D



Graph E *



Adapted from *Discovering Algebra: An Investigative Approach* by Murdock, Kamischke, and Kamischke

EXAMPLE 2 Does each relationship of the form (input, output) represent a function? If the relationship does not represent a function, find an example of one input that has two or more outputs.

a) (city, zip code) NOT A FUNCTION
b) (person, birth date) FUNCTION
c) (last name, first name) NOT A FUNCTION (FISCHER, SARAH) (FISCHER, ALEX)
d) (state, capital) FUNCTION

Give an example of an (input, output) relationship that is a function.

(person, eye color)
(person, nose)

Give an example of an (input, output) relationship that is not a function.

(area code, city)

EXAMPLE 3 Determine whether each table of x- and y-values represents a function. Explain your reasoning.

Table 1	
Input x	**Output** y
0	5
1	7
3 →	10
7	9
5	7
4	5
3 →	8

Table 2	
Input x	**Output** y
3	7
4	9
8	4
5	5
9	3
11	9
7	6

Table 3	
Input x	**Output** y
2	8
3	11
5	12
7	3
9	5
8	7
4	11

Table 1: Function / (Not a Function) Explain: _____

Table 2: (Function) / Not a Function Explain: _____

Table 3: (Function) / Not a Function Explain: _____

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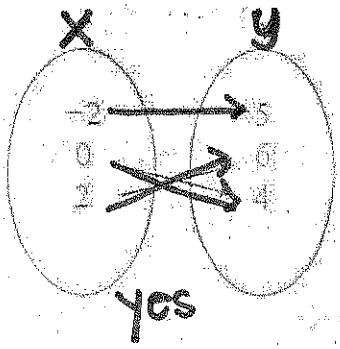
Practice with Determining if a Relation is a Function – Homework

Determine if the relation is a function

1. $\{(3,4),(4,-6),(5,-7),(3,2),(-2,5)\}$ NOT A FUNCTION
2. $\{(-4,6),(-3,2),(1,0),(7,6),(8,2)\}$
3. $\{(-3,4),(-2,5),(0,0),(-2,5),(4,8)\}$
4.

1.

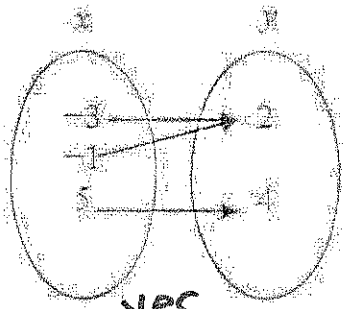
x	y
3	4
4	-6
5	-7
3	2
-2	6



YES

x	y
-2	5
0	4
2	6

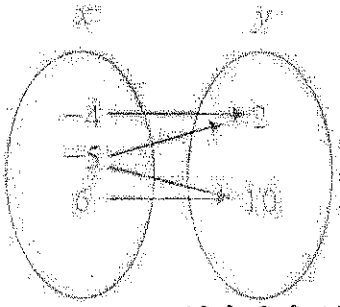
5.



YES

x	y
-3	2
-1	2
5	4

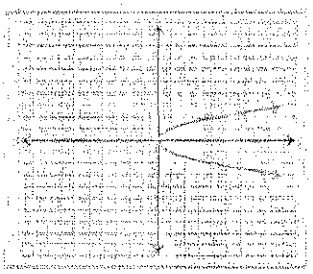
6.



NO, NOT A FUNCTION

x	y
-4	2
-5	2
-5	10

7.



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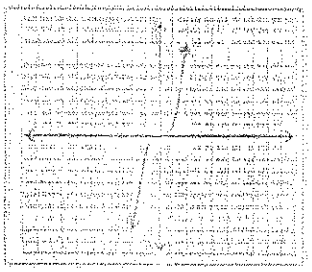

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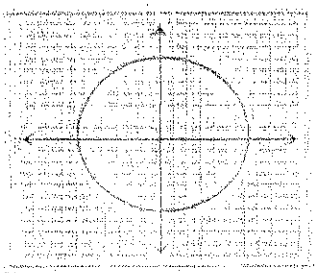


10. $y = 2x - 4$

11. $x = y^2$

12. $x = \sqrt{y}$

13. $y = x^2$

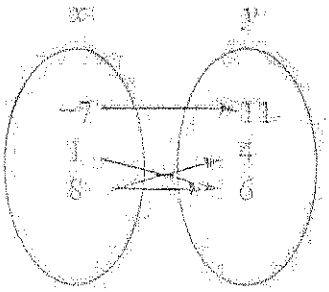
Determine the Domain and Range of each relation.

14. $\{(-5,1),(-3,0),(-1,2),(0,3)\}$

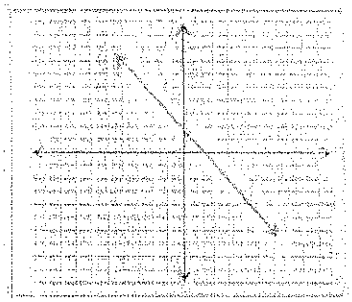
15. $\left\{\left(-6,\frac{1}{2}\right),\left(-2,\frac{1}{4}\right),\left(0,\frac{3}{2}\right),\left(1,\frac{1}{4}\right)\right\}$

16. $\left(\frac{2}{5},-1\right),\left(\frac{-3}{5},0\right),\left(\frac{-1}{5},1\right),\left(\frac{3}{5},0\right),\left(\frac{2}{4},1\right)$

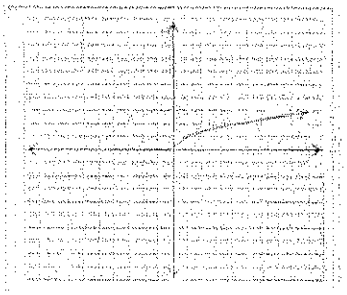
17.



18.



19.

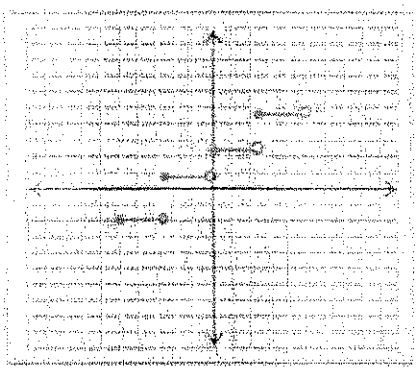


20. $y = x^2 - 3$

21. $y = |x - 4|$

III. Challenge Problems

1. Is the relation graphed below a function? Justify your answer.



2. Is a person's weight a function of their height? Why?

3. Is the height of a rocket a function of time? Why?

4. James says that since $y = |x|$ is a function, then $x = |y|$ is a function. Is he correct? Why?