Lesson 5.4: Part I - Functions

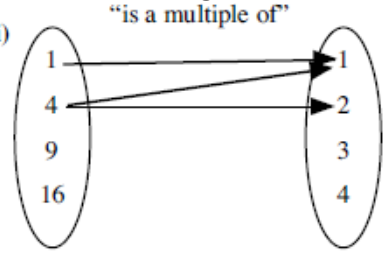
Specific Outcome: 2.1 – Explain, using examples, why some relations are not functions but all functions are relations. 2.2 – Determine if a set of ordered pairs represents a function. 2.3 – Sort a set of graphs as functions or non-functions. 2.4 – Generalize and explain rules for determining whether graphs and sets of ordered pairs represent functions.

FUNCTION:

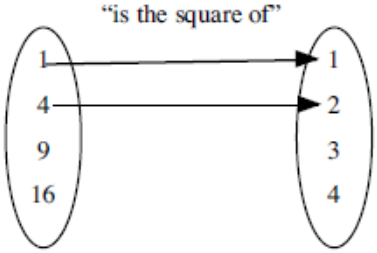
Investigation: Here are 2 different ways to relate **D: {1,4,9,16}** and **R: {1,2,3,4}** – **"is a multiple of"** and **"is the square of"**. Complete the following representations for both relations and compare what happens in the DOMAINS. Circle the representation that shows a function.

1a) Complete the **arrow diagrams**.

i) "is a multiple of"



ii) "is the square of"



b) What do you notice about the *arrows coming from the Domain* in the each relation?

2a) Complete the set of **ordered pairs** for the same relations above.

i) ii)

b) What do you notice about the *first coordinate* (Domain) in each ordered pair in each relation?

3a) Complete the **table of values**.

i)

Domain	Range

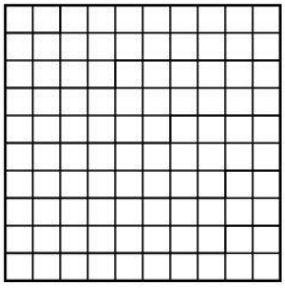
ii)

Domain	Range

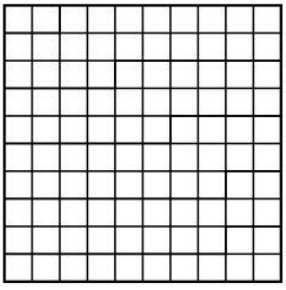
b) What do you notice about the *values in the first column* (Domain) in each relation?

4a) Complete the **graphs** (***discrete*** values).

i)



ii)



b) What do you notice about *Domain readings* on the graph in the each relation?

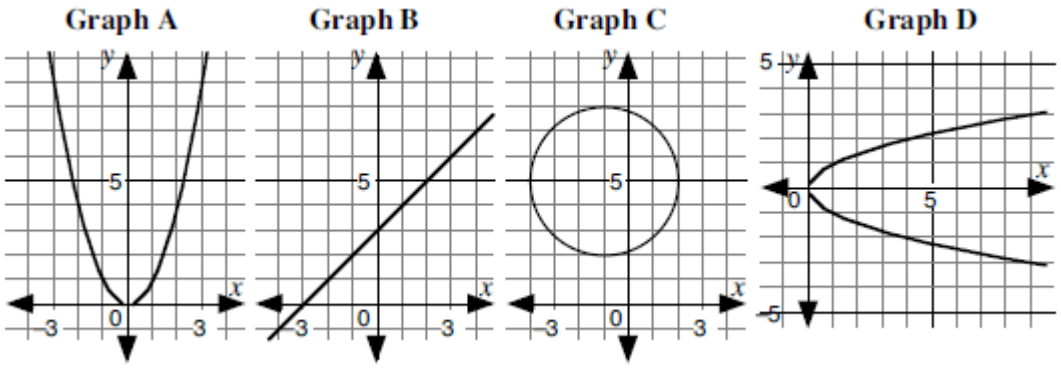
CONCLUSION: A relation is a ***function*** when _____

_____.

VERTICAL LINE TEST FOR GRAPHS WITH *CONTINUOUS* VALUES

- We can use a vertical line to determine whether a graph with continuous values is a function.
- If ***every vertical line intersects the graph exactly ONCE***, the graph represents a function.

Consider: Use the vertical line test to determine which relation represents a function.



FUNCTION? YES / NO YES / NO YES / NO YES / NO

EXPLAIN:

Practice:

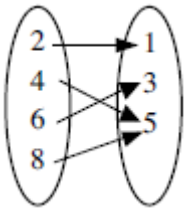
1. Determine which of the following relations are also functions.

a) $(5,8),\ (6,7),\ (-5,3),\ (2,3),\ (6,8)$

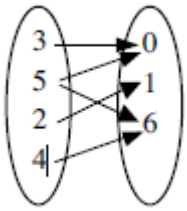
b) $(3,3),\ (2,3),\ (4,5),\ (-3,2)$

c) (0,0), (1,2), (0,2), (3,1), (1,4)

d)



e)



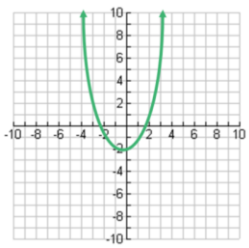
f)

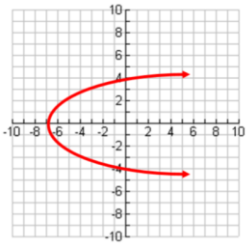
Input (x)	Output (y)
1	5
–1	5
3	5
7	5

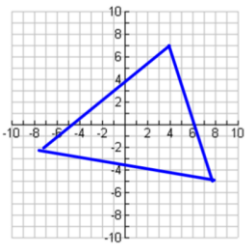
g)

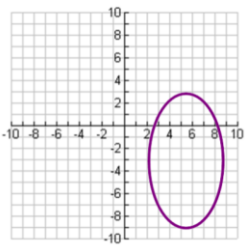
Input (x)	Output (y)
0	3
2	4
4	5
6	3

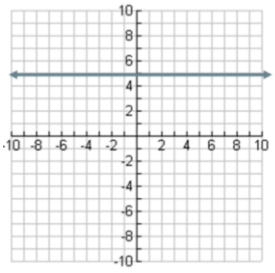
2. Use the vertical line test to determine which of the following are functions. Circle the functions.

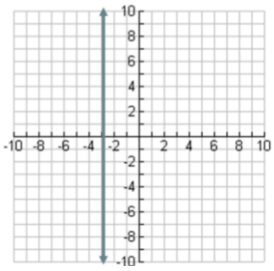












HOMEWORK: P. 270 – 1, 3, 5, 8-10, 12

Lesson 3.4: Part II – Function Notation

Specific Outcome: 8.1 – Express the equation of a linear function in two variables, using function notation. 8.2 – Express an equation given in function notation as a linear function in two variables. 8.3 – Determine the related range value, given a domain value for a linear function. 8.4 – Determine the related domain value, given a arrange value for a linear function.

FUNCTION NOTATION:

- Instead of using "*y* = " , we use "*f(x)* = "
- Notice that the *x* shows up on both sides of the equation.
- *f(x)* is read: "*f* of *x*" and does **not** mean *f* times *x*!

Practice: Write the following equations in function notation.

a) $y = -3x - 4$ b) $y = \frac{1}{2}x + 8$ c) $y = -0.25x + 1.5$ d) $y = 100 - 16x$

*****USING FUNCTION NOTATION: SOLVING FOR $f(x)$**

Consider the equation $y = 2x + 3$: We can find the value of y when $x = -4$ as follows:

$y =$

$y =$

$y =$

Similarly for the function $f(x) = 2x + 3$: We can find the value of $f(x)$ when $x = -4$ as follows:

$f(\ \ ) =$

$f(\ \ ) =$

$f(\ \ ) =$

Practice: Given the function $f(x) = x^2 - 4$, evaluate the following.

a) *f(3)* b) *f(-2)* c) *f(0)* d) *f(-2.5)* e) *f(1)*

****USING FUNCTION NOTATION: SOLVING FOR x**

Consider the equation $y = 10x - 3$: We can find the value of x when $y = 47$ as follows:

$=$

Similarly for the function $f(x) = 10x - 3$: We can find the value of x when $f(x) = -53$ as follows:

=

Practice: In each of the following, determine the value of x.

a) For the function $f(x) = 5x - 7$, find the value of *x* if *f(x)* = 43

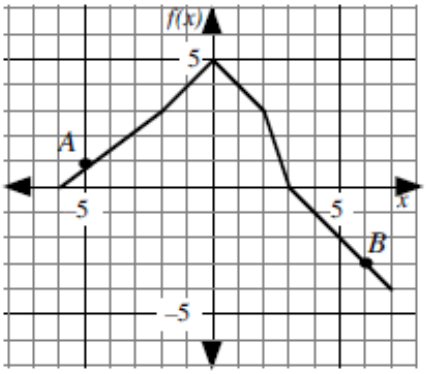
b) For $f(x) = 3 - 6x$, find the value of x if $f(x) = -24$

c) For $f(x) = -3x + 1$, determine the value of x when $f(x) = 22$.

d) If $f(x) = 2 - x^2$, determine the value of x when $f(x) = -7$.

e) When $C(n) = 56 - 3n$, determine the value of n if $C(n) = 11$.

More Practice: The graph of a function *f* is shown.



a) Complete:
i) $f(5)$ = ii) $f(-2)$ = iii) $f(4)$ =

b) Write the ordered pairs associated with each in a) above:
i) ii) iii)

c) State the values of *x* if:
i) $f(x) = -1$ ii) $f(x) = 3$ iii) $f(x) = 4$

d) Write the domain and range in set notation and interval notation.

Problem Solving:

1. The equation $V = -0.08d + 50$ represents the volume, *V* liters, of gas remaining in a vehicle's tank after travelling d kilometers. The gas tank is not refilled until it is empty.

   a) Identify the independent variable: _____ dependent variable: _____

   b) Write the equation in function notation.

   c) Determine the value of $V(600)$. What does this number represent?

   d) Determine the value of *d* when $V(d) = 26$. What does this number represent?

2. The equation $C = 100 + 25n$ represents the cost, C dollars, for a feast following an Arctic sports competition, where n is the number of people attending.
   a) Write this equation in function notation.

   b) Determine the value of $C(100)$. What does this number represent?

   c) Determine the value of n when $C(n) = 5000$. What does this number represent?

4. The function $f(x) = 6 - 2x$ has D: $\{0,2,4,6,8\}$. Which of the following is not an element of the range of the function?

   A. -10 **B**. 2 **C**. 4 **D**. -6

5. Which of the following statements is not always true for a function?

   A. A function is a set of ordered pairs (x, y) in which for every x there is only one y.
   B. A vertical line must not intersect the graph of a function in more than one point.
   C. For every output there is only one input.
   D. For every element in the domain, there is only one element in the range.

HOMEWORK: P.271 – 6, 7, 14, 15, 17. 18ab, 19ab, *20