Functions and Relations Notes

Terms to Know

◇ **Relation:** a set of _____ that has an _____

◇ **Function:** a _____ such that every single _____ has exactly

_____ output.

*The notation of a function is important in higher mathematics such
as calculus and in areas which use mathematics such as physics.*

◇ **Domain:** _____

◇ **Range:** _____

How do I determine if a relation is function?

◇ Each input must have _____ output.

◇ When given a graph – the vertical line test: **NO** vertical line can pass through

_____ points on the graph.

Here are 2 examples of functions and the third is NOT a function.

1) Input the number of seconds after the starting gun in a race to get an output of the number of meters the runner has covered.

Race Chart				
number of seconds (input)	1	4	7	8
meters covered (output)	5	20	35	40

2) $y = x - 6$, where x is the place holder (also called a _____) for the input and y is the place holder for the output.

function $y = -x - 6$				
x (input)	-3	0	7	8
y (output)	-9	-6	1	2

3) The rule about only <u>one output</u> each time is crucial and must not be violated.

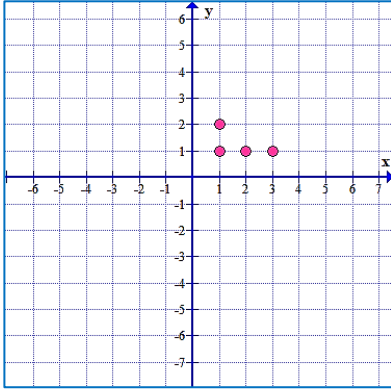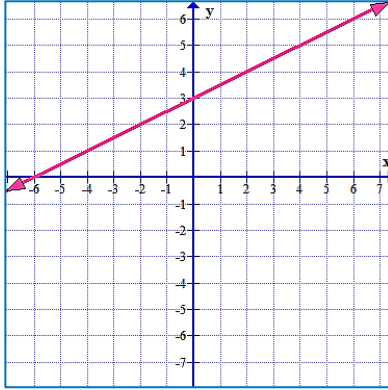| not a function				
input	3	2	0	3
output	4	-1	2	-3

Why is this not a function? _____

_____

You Try: Determine whether each of the following is a function.

1) $\{(3,2),(4,3),(5,4),(6,5)\}$

2)

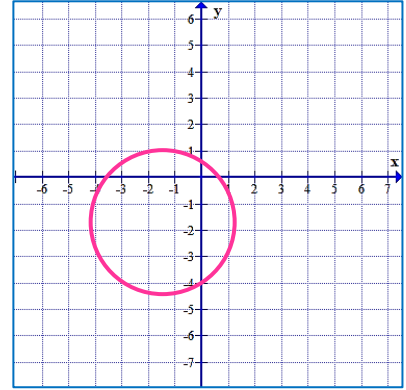

3)

4)

Function Notation

◇ Function notation is _____. It is

   pronounced _____.

◇ $f(x)$ is a fancy way of writing _____ in an _____.

Example: $f(x) = 2x + 4$ is the same as $y = 2x + 4$

Function Notation	x – y Notation
$f(x) = 5x + 2$	
	$y = -3x - 7$

Evaluating Functions

1) Given $f(x) = 2x + 3$, find $f(-2)$.

2) Given $f(x) = 32(2)^x$, find $f(3)$.

3) Given $f(x) = x^2 - 2x + 3$, find $f(-3)$.

4) Given $f(x) = 3^x + 1$, find $f(3)$.

Function Notation – Continued

When a function can be written as an equation, the symbol $f(x)$ replaces y and is read as "the value of function f at x" or simply "f of x".

This does NOT mean f times x.

Replacing y with $f(x)$ is called writing a function in function notation.

★ REMEMBER ★ $f(-3)$ means -3 if your input and you plug it in for x

    ★ $f(x) = -3$ means -3 is your output and your whole function is equal to -3 and you plug -3 into the y

Examples:

1) If $f(x) = 2x - 3$, find the following.

    a) $f(-2)$ b) $f(7)$ c) $f(-4)$

2) If $k(x) = -7x + 1$, find the following.

    a) $k(0)$ b) $k(-1)$ c) $k(5)$

Sometimes, there will be multiple x's in an equation. When this occurs, simply replace all of values of x.

3) If $h(x) = x^2 - 3x + 5$, find the following.

    a) $h(-3)$ b) $h(5)$

4) If $p(x) = x^2 + 5x - 3$, find the following.

    a) $p(-2)$ b) $p(1)$

5) If $f(x) = 5x - 3$, complete the following table of values. Then determine what type of function it is.

x	-2	-1	0	1	2	3
$f(x)$						

Function Notation Worksheet

1) Evaluate the following expressions given the functions below.

$$g(x) = -3x + 1 \qquad f(x) = x^2 + 7 \qquad h(x) = \frac{12}{x} \qquad j(x) = 2x + 9$$

a) $g(10) =$

b) $f(3) =$

c) $h(-2) =$

d) $j(7) =$

e) $h(a) =$

f) Find x if $g(x) = 16$

g) Find x if $h(x) = -2$

h) Find x if $f(x) = 23$

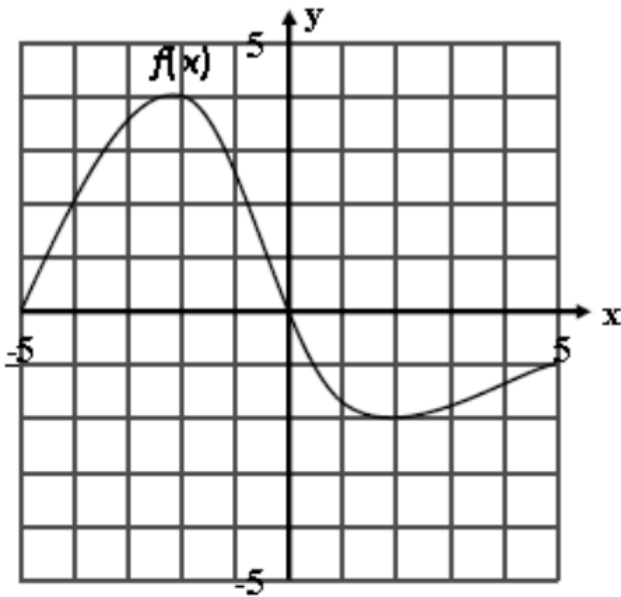2) Translate the following statements into coordinate points.
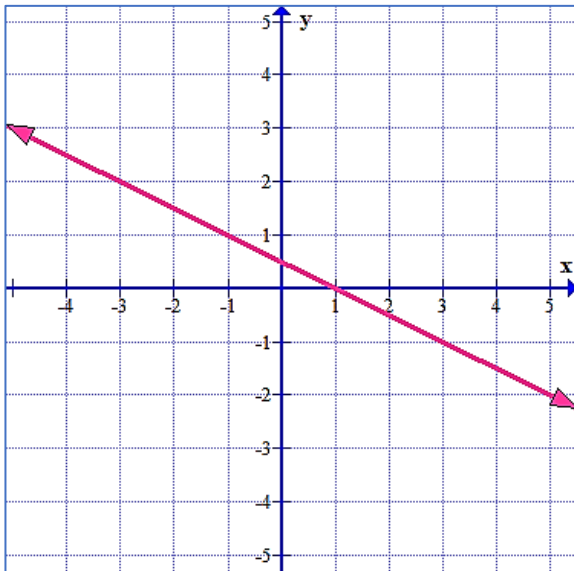
a) $f(-1) = 1$

b) $h(2) = 7$

c) $g(1) = -1$

d) $k(3) = 9$

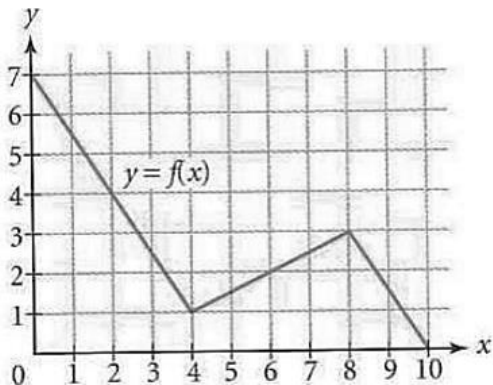3) Given this graph of function $f(x)$, find the following.

a) $f(-4) =$

b) $f(0) =$

c) $f(3) =$

d) $f(-5) =$

e) x such that $f(x) = 2$

f) x such that $f(x) = 0$

4) Evaluate the function using the following graph.

a) $f(-1) =$

b) $f(3) =$

c) $f(\_\_\_\_) = 0$

d) $f(\_\_\_\_) = 3$

5) Look at the graph below. Find the following values of the function.

a) $f(6) =$

b) $f(2) =$

c) $f(0) =$

d) $f(5) =$

e) For which value(s) of x is the following statement true? $f(x) = 1$

Function Notation – Quotable Puzzle

Directions: Solve the following problems. Match that answer to the correct letter of the alphabet. Enter that letter of the alphabet on the blank corresponding to the problem number. #15 is completed for you.

<u>F</u> __ __ __ __ __ __ __ __   __ __ __ __   __ __ __
15 12 4 2 9 8 14 4 10   3 1 10 10   9 11 7

<u>V</u> __ __ __ __ __ __   __ __ __ __   __ __ __ __
7 6 9 8 2 1 13   13 8 4 7   9 7 10 9

A	B	C	D	E	F	G	H	I	J	K	L	M
9	0	-1	-16	18	16	-2	-4	3	2	-9	1	-3

N	O	P	Q	R	S	T	U	V	W	X	Y	Z
-7	4	5	7	8	23	-5	-8	15	-23	11	42	-18

Simplify.

1) $f(x) = 2x - 1$. Find $f(5)$.

2) $f(x) = x^2 - 3x - 1$. Find $f(3)$.

3) $f(x) = 2x + 5$. Find $f(0)$.

4) $f(x) = -2x^2 - 5$. Find $f(-1)$.

5) $f(x) = x + 5$. Find $f(-7)$.

6) $f(x) = 6x^2 + 2x$. Find $f(1)$.

7) $f(x) = \frac{1}{4}x + 2x$. Find $f(8)$.

8) $f(x) = 4x - 5$. Find $f(2)$.

9) $f(x) = x^3 - 2x - 1$. Find $f(-2)$.

10) $f(x) = x^4 + 2x^2 - 1$. Find $f(2)$.

11) $f(x) = -4x - 8$. Find $f(-1)$.

12) $f(x) = 2x - 10$. Find $f(1)$.

13) $f(x) = x^3 - 2x^2 + x + 5$. Find $f(-1)$.

14) $f(x) = x^2 - 21$. Find $f(5)$.

15) $f(x) = (x - 2)^2$. Find $f(-2)$.
$$f(-2) = ((-2) - 2)^2$$
$$f(-2) = (-2 - 2)^2$$
$$f(-2) = (-4)^2$$
$$f(-2) = 16$$