

## Functions and Relations

Name: KEY Class Period \_\_\_\_\_

### Terms to Know:

- Relation: Any set of input that has an output.
- Function: A relation such that every single input has exactly ONE output.
- Domain: X Coordinate; Independent Variable; Input
- Range: Y Coordinate; Dependent Variable; Output

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

### Here are a few examples:

- 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

- $y = x - 6$ , where  $x$  is the variable for the input and  $y$  is the variable for the output.

Function:  $y = x - 6$

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

- The rule about only one output 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? The input 3 has 2 outputs, 4 & -3.

### How do I determine if a relation is a function?

- Each input must have EXACTLY ONE output.
- Look at the graph....The vertical line test: No vertical line can pass through two or more points on the graph.

Examples: Are these relations functions? (Examples on Function Notes Powerpoint)

1. Function

2. Function

3. Relation

4. Function

5. Relation

6. Function

### Function Notation:

⊙ Function notation is a way to name a function. It is pronounced "f of x" →  $f(x)$

⊙  $f(x)$  is a fancy way of writing y in an equation

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

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

### Evaluation Functions:

1. Evaluate  $f(x) = 2x - 3$  when  $x = -2$

$$f(-2) = 2(-2) - 3$$
$$= -4 - 3$$

$$f(-2) = -7$$

2. Evaluate  $f(x) = 32(2)^x$  when  $x = 3$

$$f(3) = 32(2)^3$$
$$= 32(8)$$

$$f(3) = 256$$

3. Evaluate  $f(x) = x^2 - 2x + 3$ , when  $x = -3$

$$f(-3) = (-3)^2 - 2(-3) + 3$$
$$= 9 + 6 + 3$$

$$f(-3) = 18$$

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

$$f(3) = 3^3 + 1$$
$$= 27 + 1$$

$$f(3) = 28$$

### Domain and Range:

• Only list repeats once

• Put in order from least to greatest

What is the Domain and Range?

1. D:  $\{1, 2, 3, 4, 5, 6\}$  2. D:  $\{0, 1, 2, 3, 4\}$

R:  $\{1, 3, 6, 10, 15, 21\}$  R:  $\{1, 2, 4, 8, 16\}$

3. D:  $\mathbb{R}$

R:  $\mathbb{R}$