**Functions Video Lecture**

**Section 3.6**

**Course Learning Objective:**

>   Demonstrate appropriate manipulation of function notation and be able to find the domain and range of a function.

**Weekly Learning Objectives:**

1)  Identify relations, domains, ranges, arguments, and images.

2)  Identify functions.

3)  Use the vertical line test.

4)  Evaluate and simplify function notation.

# Functions

A <u>relation</u> is any set of ordered pairs.
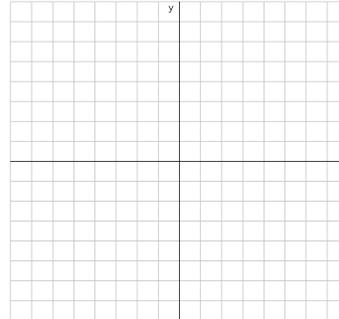It is a correspondence that maps x values to y values.

**Different ways of representing a relation:**

**List** {(-1,3), (2,4), (6,1), (6,2)}

**Correspondence or Mapping**                     **Graph**



     **Domain:** the set of all inputs

     **Argument:** a specific input value (x-value)

     **Range:** the set of all outputs

     **Image:** a specific output value (y-value)

Find the image of the argument 2:
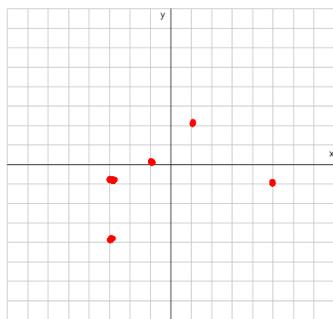
Find the argument of the image 2:

1 is the image of:

Definition of a <u>function</u>: a relation that sends every input to <u>exactly one</u> output
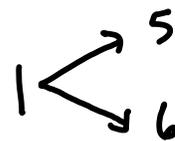
**Example that is not a function**               **Example that is a function**
    Spam e-mail                                    Regular Mail

**Determine whether each of the following is a function or not and find the domain and range of each.**



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



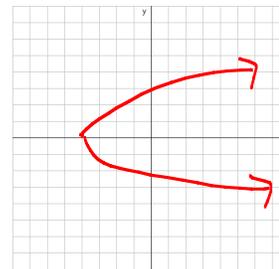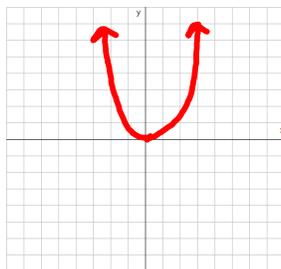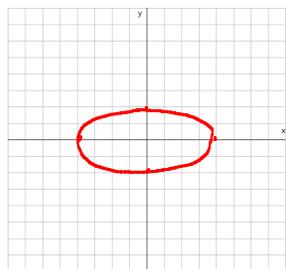| | | |
|---|---|---|
| **Function:** | **Function:** | **Function:** |
| **Domain:** | **Domain:** | **Domain:** |
| **Range:** | **Range:** | **Range:** |

**<u>Vertical Line Test</u>:** A graph will be a function if no vertical line intersects the graph in more than one point.

**Determine whether each of the following is a function or not and find the domain and range of each.**



| | | |
|---|---|---|
| **Function:** | **Function:** | **Function:** |
| **Domain:** | **Domain:** | **Domain:** |
| **Range:** | **Range:** | **Range:** |

**Function notation:**         $f(x) = x^2$         $g(x) = 2x - 3$

$$f(\boxed{\phantom{x}}) = \boxed{\phantom{x}}^2 \qquad g(\boxed{\phantom{x}}) = 2\boxed{\phantom{x}} - 3$$

**f(4) =**                    **g(6) =**                    **f(a) =**

**f(a + b) =**                                **g(a + b) =**

**f(a + b) - f(a) =**

$f(x) = x^2 - 2x + 1$                                     $g(x) = \sqrt{x-1}$

$p(x) = \{(-1,2), (3, -6), (4,1), (1,4)\}$


**Find:**

**f(x+h)-f(x) =**                                         **2f(x+1) =**




**p(4) =**                                                **g(0) =**




**g(x+2) =**

**Let f(x) =** $3x^2 - x + 1$                                 **g(x) = 5x - 3**

**Find:**

**2f(x+1) + g(x) - 4 =**                                      **g(a) + g(b) =**

**g(x-3) + 2 =**                                             **2 - g(xy) =**

**(f(x))$_2$ - 2(x+3) =**                                  $f\left(\dfrac{x}{2}\right) =$

$$\dfrac{f(x)}{2} =$$