

Functions Video Lecture

Sections 2.1 and 2.2

Course Learning Objectives:

Demonstrate an understanding of the concept of function, and functional attributes such as domain and range. Determine these attributes for a function given its graph and/or its rule.

Weekly Learning Objectives:

- 1) Determine whether a relation represents a function.**
- 2) Find the domain, range, argument and image of a function.**
- 3) Use the vertical line test.**
- 4) Find the value of a function and simplify function notation.**
- 5) Find a simplified difference quotient for a function.**
- 6) Find the domain of a function defined by an equation.**

Functions

A **relation** is any set of ordered pairs.

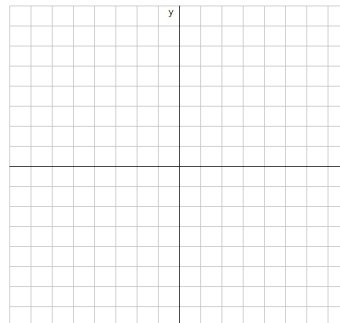
It is a correspondence that maps x values to y values.

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:

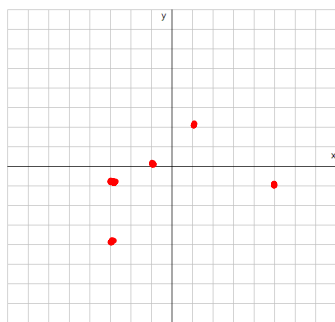
1 is the image of:

Definition of a **function**: a relation that sends every input to exactly one output

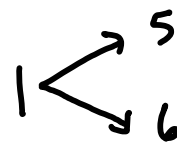
Example that is not a function
Spam e-mail

Example that is a function
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:

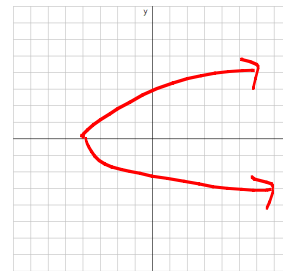
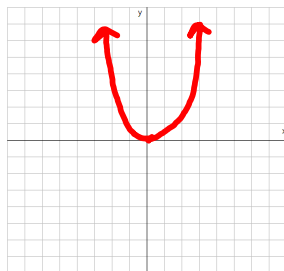
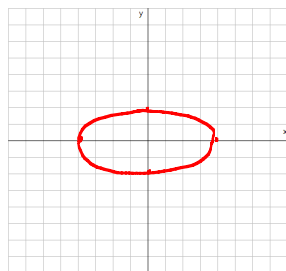
Range:

Range:

Range:

Vertical Line Test: 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:

$$f(x) = x^2$$

$$g(x) = 2x - 3$$

$$f(\square) = \square^2$$

$$g(\square) = 2\square - 3$$

$$f(4) =$$

$$g(6) =$$

$$f(a) =$$

$$f(a + b) =$$

$$g(a + b) =$$

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

$$f(x) = x^2 - 2x + 1$$

$$g(x) = \sqrt{x-1}$$

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

Find:

$$f(x+h)-f(x) =$$

$$2f(x+1) =$$

$$p(4) =$$

$$g(0) =$$

$$g(x+2) =$$

$$\text{Let } f(x) = 3x^2 - x + 1$$

$$g(x) = 5x - 3$$

Find:

$$2f(x+1) + g(x) - 4 =$$

$$g(a) + g(b) =$$

$$g(x-3) + 2 =$$

$$2 - g(xy) =$$

$$(f(x))_2 - 2(x+3) =$$

$$f\left(\frac{x}{2}\right) =$$

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

Difference Quotients:

$$\frac{f(x+h) - f(x)}{h}$$

Find the simplified difference quotient of $f(x)$: $f(x) = 2x^2 - 3x + 1$

Finding Domains of a Function:

Remember that the domain of a function is the set of all x 's that make $f(x)$ defined.

Some typical domain issues that might result in a restricted domain include:

- 1) dividing by zero
- 2) taking an even root of a negative number

Find the domain of the following functions:

$$f(x) = x^2 + 5x$$

$$f(x) = \frac{x-3}{x^2-4}$$

$$f(x) = \sqrt{3-2x}$$

$$f(x) = \frac{x+2}{x^3-4x^2-9x+36}$$