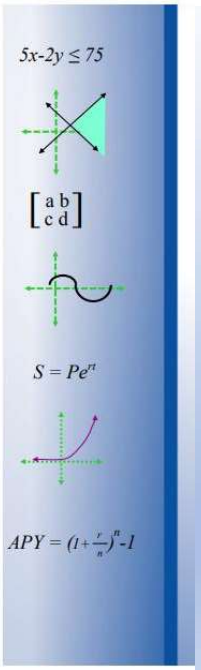


Math 1090 ~ Business Algebra

Section 1.5 Functions

Objectives:

- Identify relations that are functions.
- Use the vertical line test to distinguish a function.
- Determine the domain and range of a function presented graphically.
- Evaluate a function or relation at a given input value or expression.

relation vs. function

a rule that gives output(s) for a given input

a relation that assigns exactly one output to every allowable input

- domain: the set of all allowable inputs
- range: set of all outputs

Ex. 1: Which of these relations are functions?

	Input	Output	
a)	x = person	y = their phone	relation
b)	x = student at the UofU	y = location at 9 am on first day of the semester	function
c)	x = person	y = places they have lived	relation
d)	x = Math 1090 student	y = grade in Math 1090 this semester	function

Different Ways to Describe functions

- Ordered pairs {(1,2), (3,5), (4,5)}

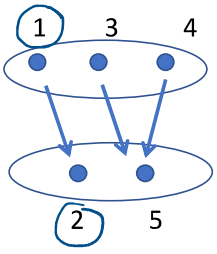
Inputs / Domain: {1, 3, 4}

Outputs / Range {2, 5}

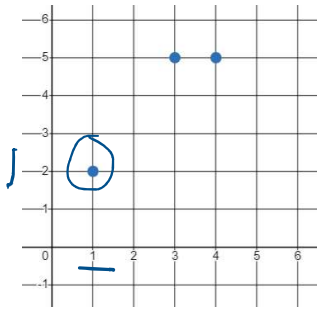
- Tables:

Input	Output
1	2
3	5
4	5

- Drawings



- Graphs

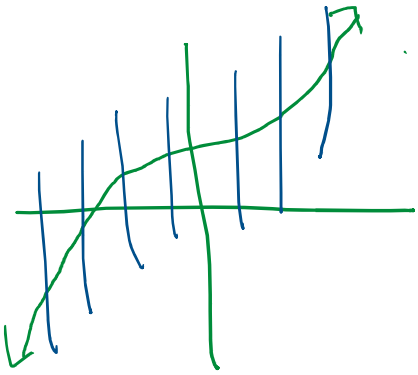


- And algebraic notation

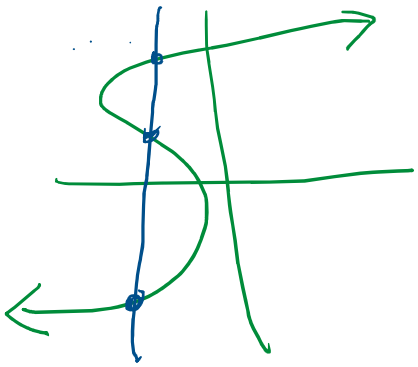
$y = x^2 + 2$

$f(x) = -4x$

Vertical line test. If we graph all the ordered pairs of a relation on a Cartesian coordinate system, and every vertical line goes through the graph at most one time, then it is a function.



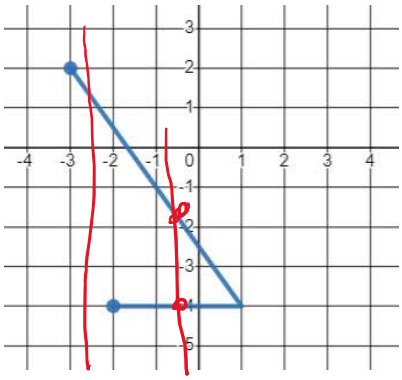
is a function



not a function

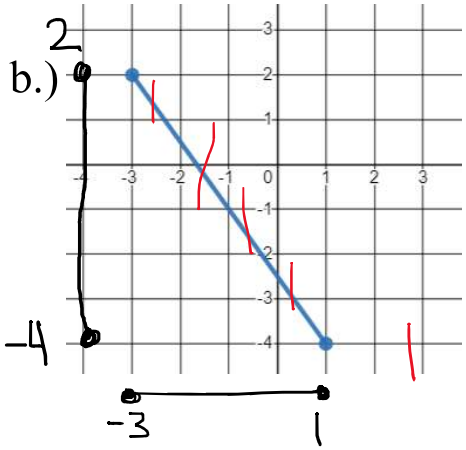
Ex. 2: Are these functions? If no, explain why not. If yes, give the domain and range.

a.)



This is not a function because there is a vertical line that goes through it more than once.

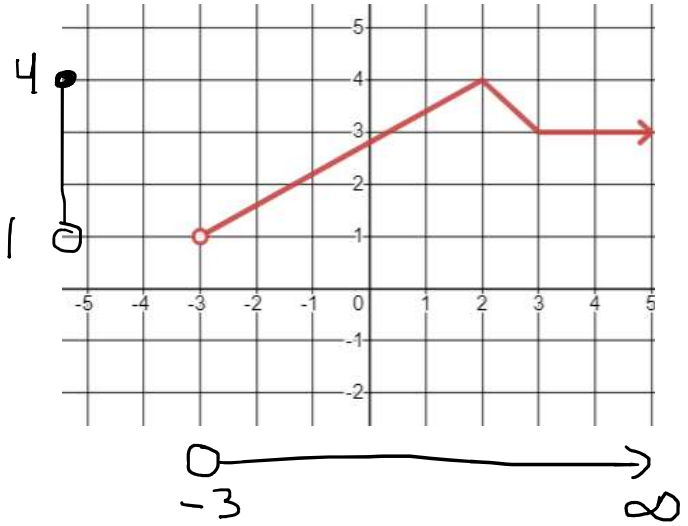
b.)



Domain: $[-3, 1]$ or $-3 \leq x \leq 1$

Range: $[-4, 2]$ $-4 \leq y \leq 2$

Ex. 3: Find the domain and range of this function.



Domain

$(-3, \infty)$ or $-3 < x$

Range

$(1, 4]$ $1 < y \leq 4$

Ex. 4: Given $f(x) = 4x^2 - 5x$, find

a) $f(-2)$

$= 4(-2)^2 - 5(-2)$

$= 4 \cdot 4 + 10$

$= 16 + 10 = 26$

b) $f(2)$

$= 4(2)^2 - 5(2)$

$= 4 \cdot 4 - 10$

$= 16 - 10$

$= 6$

c) $f(a) = 4a^2 - 5a$

d) $f(x-h)$

$= 4(x-h)^2 - 5(x-h)$

$= 4(x^2 - 2xh + h^2) - 5(x-h)$

$= 4x^2 - 8xh + 4h^2 - 5x + 5h$

$= 4x^2 - 8xh - 5x + 4h^2 + 5h$