

FST 2-1 Notes

TOPIC: The language of functions

GOAL

Give two equivalent definitions for functions (as a set of ordered pairs and as a correspondence) and discuss the basic properties and language of functions. Discuss three representations of function: ordered pairs, graphs, and rules such as equations.

Spur Objectives

- A** Work with $f(x)$ notation for function values.
- C** Identify the variables, domain, and range of functions.
- H** Interpret properties of relations from graphs.

Vocabulary

- mathematical model
- relation
- independent variable
- dependent variable
- function, ordered pair
- definition
- domain of a function
- range of a function
- function, correspondence
- definition
- real function
- member of a set, element of a set, \in
- piecewise definition of a function
- value of a function

Function is a set of ordered pairs (x, y) in which each first component (x) is paired with exactly one second component (y)

y
↑
dependent variable

Domain the set of ALL x -values
It's the independent variable

Range the set of ALL y -values.
It's the dependent variable

↓
x
independent variable

1) State the **domain** and **range** of the following:

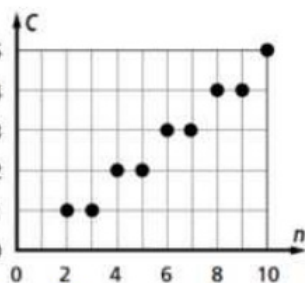
- a) $\{ (3, -2), (4, -3), (5, -4), (6, -5) \}$

$D: \{ 3, 4, 5, 6 \}$
 $R: \{ -2, -3, -4, -5 \}$

The symbol	represents the set of all
Z	integers.
R	real numbers.
Q	rational numbers.
N	natural numbers.

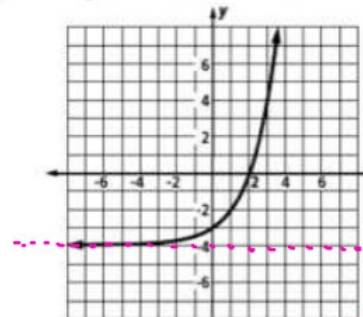
$-1, -2, 0, 1, 2$
All #s
fraction, decimals
 $1, 2, 3, 4, 5$

- $(10, 5)$
 $(8, 4)$ $(9, 4)$
 $(6, 3)$ $(7, 3)$
 $(4, 2)$ $(5, 2)$
 $(2, 1)$ $(3, 1)$



$D: \{ 2, 3, 4, 5, 6, 7, 8, 9, 10 \}$
 $R: \{ 1, 2, 3, 4, 5 \}$

c) $y = 2^x - 4$



horizontal asymptote
 $y = -4$

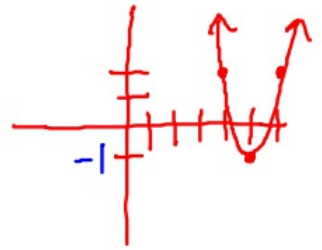
$D: \{ x | x \in \mathbb{R} \}$
 $R: \{ y | y > -4 \}$

2) Find the domain and range of the function with rule $y = 3(x-5)^2 - 1$.

Such that x is a member of reals

$$D: \{x \mid x \in \mathbb{R}\}$$

$$R: \{y \mid y \geq -1\}$$



3) State whether or not these are functions.

* Can't have repeating x-values

Input	Output	Input	Output	Input	Output	Input	Output
1	2	4	0	1	5	4	0
2	4	4	1	2	7	6	1
3	4	6	4	3	9	8	1
4	5	8	4	4	9	8	4
				1	7		

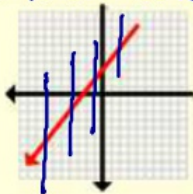
Yes function

Not a function

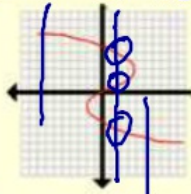
No

Yes

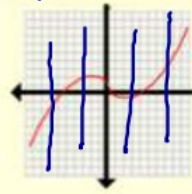
* vertical Line Test - 1 vertical line can only touch the graph in 1 spot



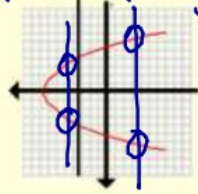
Yes



Not a function
- fails VLT



Yes



No

4)

Suppose g is the function defined by $g(t) = 2t^2 - 3t - 2$ for all real numbers t .

a. Evaluate $g(-2)$, $g(3)$, and $g(-5)$.

b. Does $g(-2) - g(3) = g(-2-3)$?

c. Evaluate $g(3p+1)$.

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

$$2(4) - 3(-2) - 2$$

$$8 + 6 - 2 = 12$$

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

$$2(9) - 3(3) - 2$$

$$18 - 9 - 2 = 7$$

$$2(3p+1)^2 - 3(3p+1) - 2$$

$$2(3p+1)(3p+1) - 3(3p+1) - 2$$

$$g(-5) = 2(-5)^2 - 3(-5) - 2$$

$$= 63$$

$$b) 12 - 7 = 63$$

$$5 \neq 63$$

NO

	$3p+1$
$3p$	$9p^2 + 3p$
$+1$	$3p + 1$

$$2(9p^2 + 6p + 1)$$

$$18p^2 + 12p + 2 - 9p - 3 - 2$$

$$18p^2 + 3p - 3$$

5)

The Sudoku Club at a high school needs t-shirts for their upcoming tournament. They were able to negotiate a "buy-two-get-one-free" deal from a local store. The cost for one t-shirt is \$10.

- Which statement is true: "the cost c is a function of the number t of t-shirts" or "the number of t-shirts t is a function of the cost c ?"
- Identify the independent and dependent variables of the function.
- State the domain and range of the function.

a) Cost \$ depends on # of t-shirts
dependent "is a function" independent

b) independent = # of t-shirts
dependent = \$ cost

c)

# of t-shirts	Cost \$
0	0
1	10
2	20
3	20
4	30
5	40
6	40

Domain: All positive integers
 $\{x \mid x \in \mathbb{Z} \text{ and } x \geq 0\}$

Range: positive integers multiples of 10
 $\{10y \mid y \in \mathbb{Z} \text{ and } y \geq 0\}$

Consider again the cost c of buying t-shirts as given in Additional Example 1.

- List the ordered pairs of the function for values of t from 1 to 10.
- Graph the function.

t-shirt	\$
1	10
2	20
3	20
4	30
5	40
6	40
7	50
8	60
9	60
10	70

Cost
\$

