

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.

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

Domain THE SET OF ALL X-VALUES
 • INDEPENDENT VARIABLE

Range THE SET OF ALL Y-VALUES
 • DEPENDENT VARIABLE

Vocabulary

- mathematical model DESCRIPTION OF A REAL SITUATION USING MATH
- relation ANY SET OF ORDERED PAIRS
- independent variable 1ST VARIABLE, x
- dependent variable 2ND VARIABLE, y
- function, ordered pair definition EACH x EXACTLY 1 y
- domain of a function INPUT VALUES
- range of a function OUTPUT VALUES
- function, correspondence definition EACH ELEMENT OF "A" CORRESPONDS TO ONE ELEMENT OF "B"
- real function DOMAIN RANGE ARE REAL #S
- member of a set, element of a set, \in SET NOTATION
- piecewise definition of a function definition BREAKS DOMAIN INTO PIECES
- value of a function $f(x)$ or " y " or OUTPUT

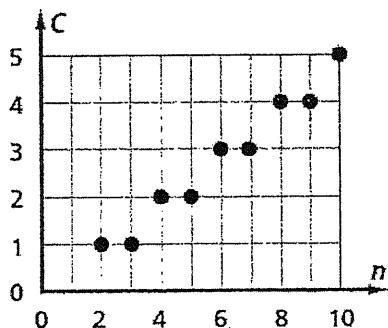
1) State the **domain** and **range** of the following:

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

DOMAIN: $\{3, 4, 5, 6\}$

RANGE: $\{-2, -3, -4, -5\}$

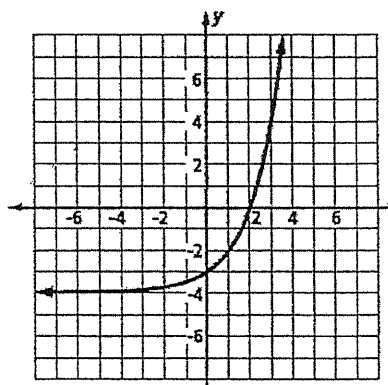
b)



DOMAIN: $\{2, 3, 4, 5, 6, 7, 8, 9, 10\}$

RANGE: $\{1, 2, 3, 4, 5\}$

c)



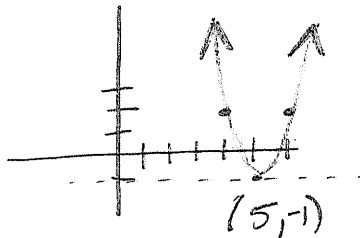
DOMAIN: All real #s

EX: $x \in \mathbb{R}$

RANGE: $y \geq -4$ or $\{y | y \geq -4\}$

The symbol	represents the set of all
\mathbb{Z}	Integers.
\mathbb{R}	real numbers.
\mathbb{Q}	rational numbers.
\mathbb{N}	natural numbers.

2) Find the domain and range of the function with rule $y = 3(x-5)^2 - 1$. • VERTEX: (5, -1)
 • VERTICAL STRETCH BY A FACTOR OF 3
 RIGHT 5
 DOWN 1



DOMAIN: $\{x | x \in \mathbb{R}\}$
 RANGE: $\{y | y \geq -1\}$

3) State whether or not these are functions.

★ CANNOT HAVE REPEAT X-VALUES

Input	Output
1	2
2	4
3	4
4	5

YES

Input	Output
4	0
4	1
6	4
8	4

NO

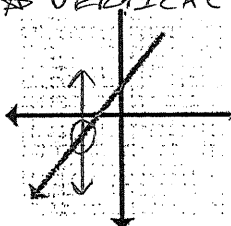
Input	Output
1	5
2	7
3	9
4	9
1	7

NO

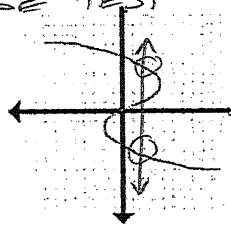
Input	Output
4	0
6	1
8	4

YES

★ VERTICAL LINE TEST - CAN ONLY TOUCH GRAPH ONCE

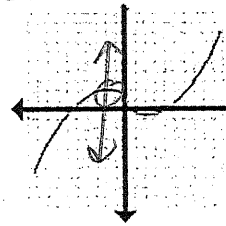


YES

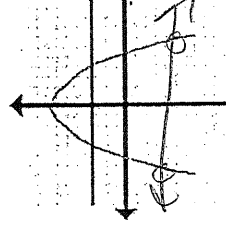


NO

★ REPEAT X!



YES



NO

★ REPEAT X!

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 $g(3p + 1)$.

$$b) \begin{aligned} g(-2) - g(3) &\stackrel{?}{=} g(-2-3) \\ 12 - 7 &\stackrel{?}{=} g(-5) \\ -5 &\neq 63 \quad \boxed{\text{NO}} \end{aligned}$$

$$a) \quad g(-2) = 2(-2)^2 - 3(-2) - 2$$

$$\boxed{g(-2) = 12}$$

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

$$\boxed{g(3) = 7}$$

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

$$\boxed{g(-5) = 63}$$

$$c) \quad g(3p+1) = 2(3p+1)^2 - 3(3p+1) - 2$$

$$2(3p+1)(3p+1) - 9p - 3 - 2$$

$$2(9p^2 + 6p + 1) - 9p - 3 - 2$$

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

$$\boxed{18p^2 + 3p - 3}$$

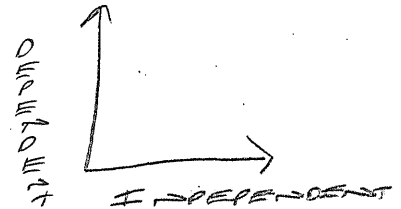
5)

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. # of SHIRTS COST \$
- State the domain and range of the function.

a) COST "DEPENDS ON" # OF SHIRTS

b) INDEPENDENT: # OF SHIRTS
DEPENDENT: COST



(t, c)
c) DOMAIN: ALL POSITIVE INTEGERS

$$\{t \mid t \in \mathbb{Z} \text{ and } t \geq 0\}$$

RANGE: ALL POSITIVE INTEGERS, MULTIPLES OF 10

$$\{10c \mid c \in \mathbb{Z} \text{ and } c \geq 0\}$$

t	c
0	0
1	10
2	20
3	20
4	30
5	40

2-1 p.4

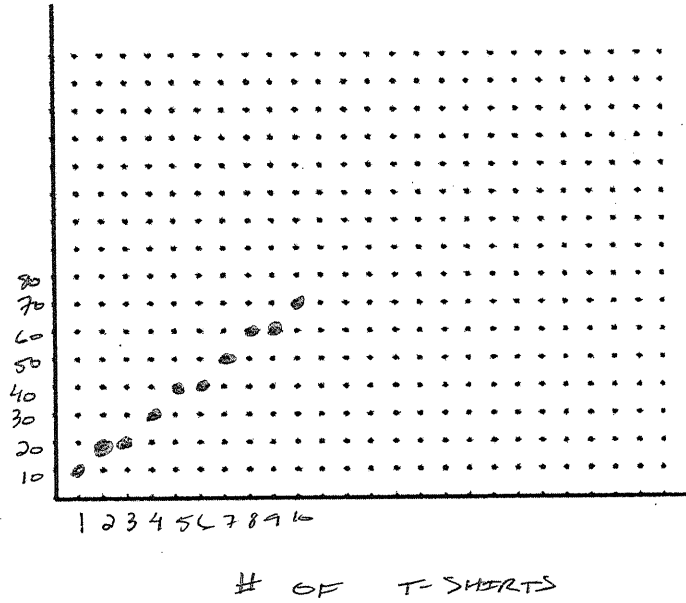
Consider again the cost c of buying t-shirts as given in Additional Example 1.

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

a)

t	c
1	10
2	20
3	20
4	30
5	40
6	40
7	50
8	60
9	60
10	70

COST
\$



NOT CORRECTED, ~~NO~~

"PARTIAL" SHIRTS SOLD