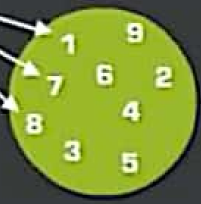
SET

Part I

A SET IS A WELL DEFINED COLLECTION OF OBJECTS.

Elements of the Set

Set (N)



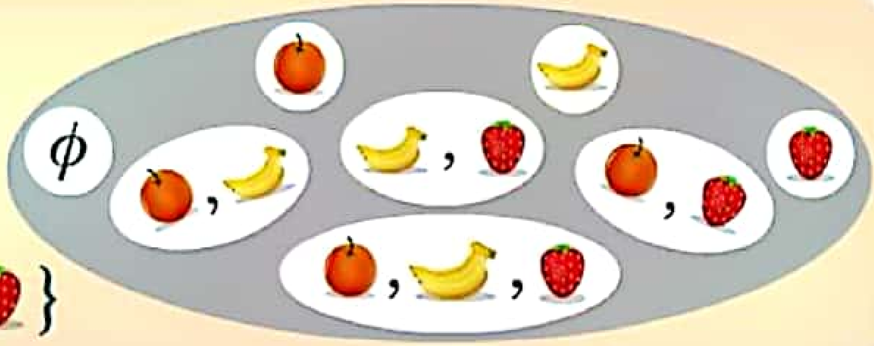
$\in \Rightarrow$ 'IS AN ELEMENT OF'
EXAMPLE: $4 \in N$

$\notin \Rightarrow$ 'IS NOT AN ELEMENT OF'
EXAMPLE: $12 \notin N$

$N = \{1,2,3,4,5,6,7,8,9\}$

1. POWER SET

POWER SET P(A)



SET A = 

2. EMPTY SET

NO ELEMENT

$\{\ \}$ or ϕ

3. FINITE SET

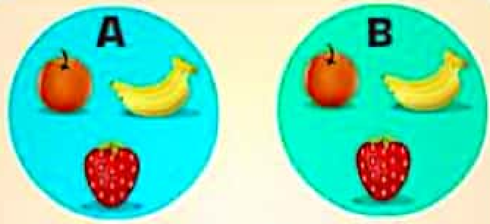
FINITE NUMBER OF ELEMENT

5. SUBSET

$A \subseteq B$,

$\in A \Rightarrow \in B$

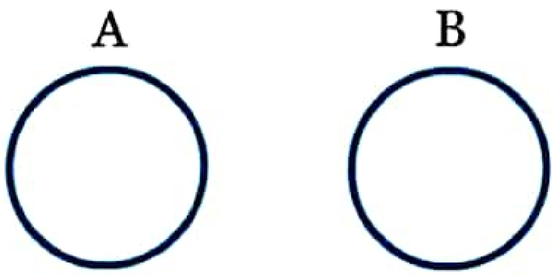
4. EQUAL SET



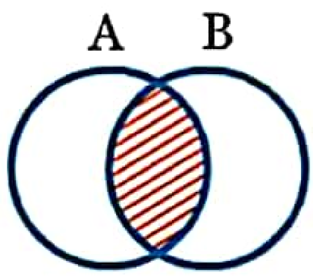
$A = B$ IF $A \subseteq B$ & $B \subseteq A$

Part II

OPERATION OF SETS

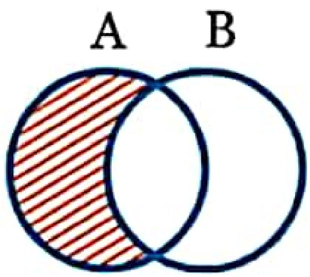


DISJOINT SET A AND B



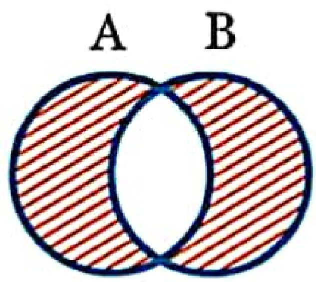
$A \cap B$

THE INTERSECTION OF A AND B



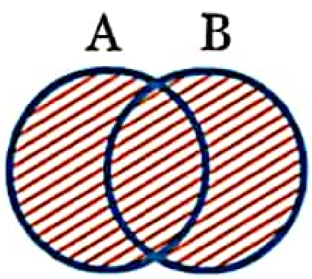
$A \setminus B$

THE RELATIVE COMPLEMENT OF B IN A



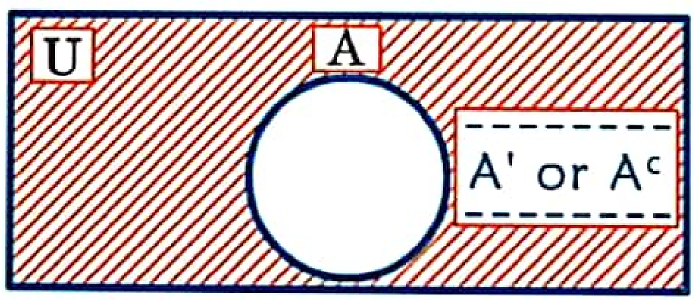
$A \Delta B$

THE SYMMETRIC DIFFERENCE OF A AND B

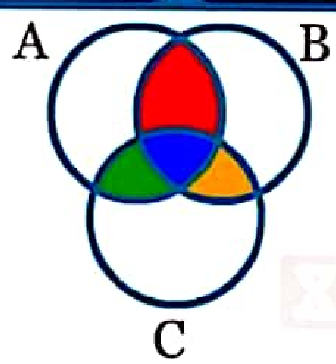


$A \cup B$

THE UNION OF A AND B



COMPLEMENT OF SET A



$A \cap B \cap C$

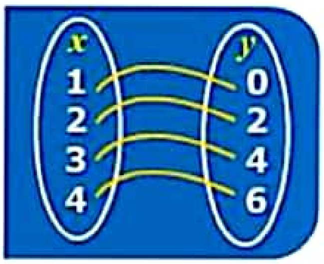
$A \cup B \cup C = A + B + C - (A \cap B) - (B \cap C) - (C \cap A) + (A \cap B \cap C)$

FUNCTIONS

Part I

A funtion is a relationship where each input has a single output.

It is written as "$f(x)$", where 'x' is the input

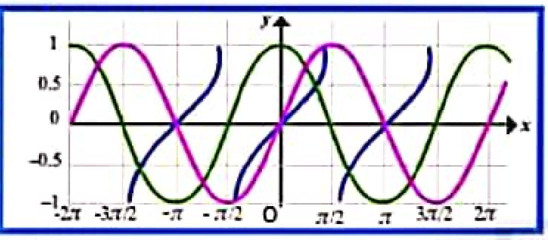


1 Trigonometric Function

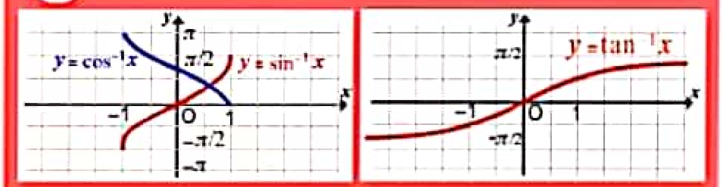
$\sin x$

$\cos x$

$\tan x$

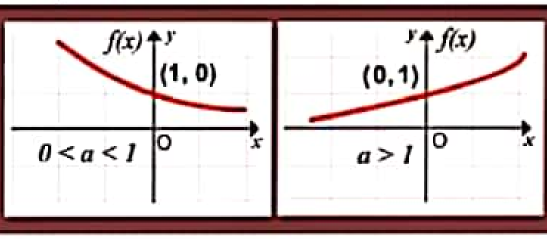


2 Inverse Trigonometric Function



3 Exponential Function

$f(x) = a^x$, where $a > 0$, $a \neq 1$



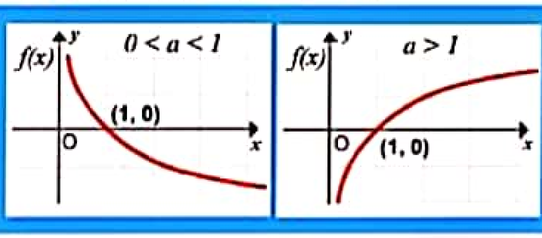
4 Logarithmic Function

$\log_a x$

$x > 0$

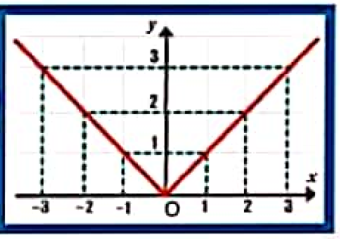
$a > 0$

$a \neq 1$



5 Absolute Value Function

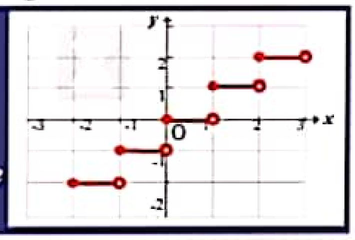
$$y = |x| = \begin{cases} x\ ;\ x \geq 0 \\ -x\ ;\ x < 0 \end{cases}$$



6 Greatest Integer Function

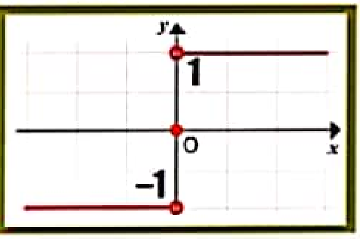
$$y = f(x) = [x]$$

$$[x] = \begin{cases} x\ \ ;\ x \in \mathrm{I} \\ \text{Greatest Integer; otherwise less than } x \end{cases}$$



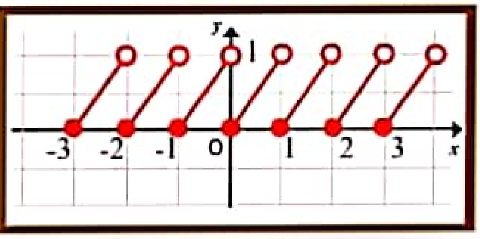
7 Signum Function

$$y = x = \begin{cases} 1\ ;\ x > 0 \\ 0\ ;\ x = 0 \\ -1\ ;\ x < 0 \end{cases}$$



8 Fractional Part Function

$$y = f(x) = \{x\} = x - [x]$$



9 Algebraic Function

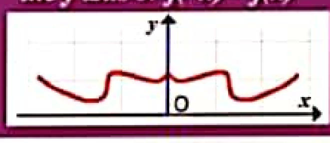
Constructed using +, −, ×, ÷ & $\sqrt{\ }$

$$\text{Ex. } f(x) = \sqrt{(x^4 + 5x^2)}$$

10 Even - Odd Function

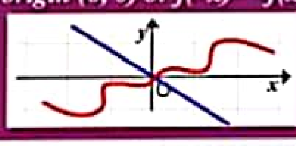
EVEN

symmetrical about the y axis or $f(-x) = f(x)$



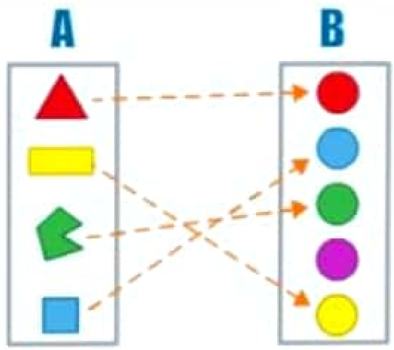
ODD

symmetrical about the origin (0, 0) or $f(-x) = -f(x)$



CLASSIFICATION OF FUNCTION

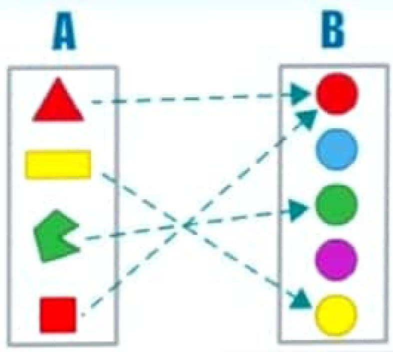
Part II



1

One-One Function

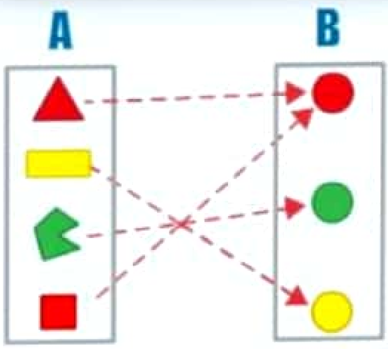
Each element of set A is connected with a different element of set B. It is also called Injective function.



2

Many-One Function

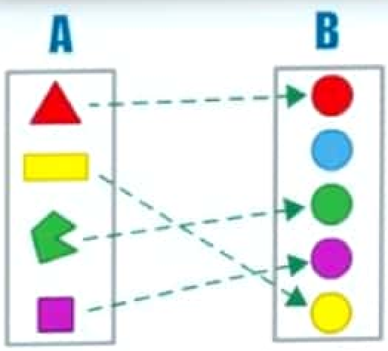
If any two or more elements of set A are connected with a single element of set B.



3

Onto Function

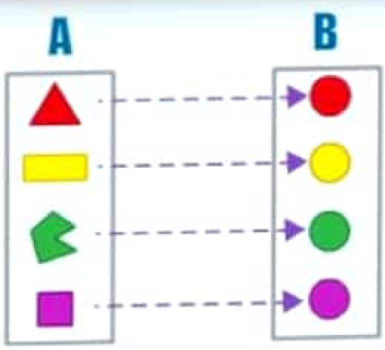
Function f from set A to set B is onto function if each element of set B is connected with elements of set A. It is also called Surjective function.



4

Into Function

Function f from set A to set B is into function if set B has at least one element which is not connected with any of the element of set A.



5

Bijective Function

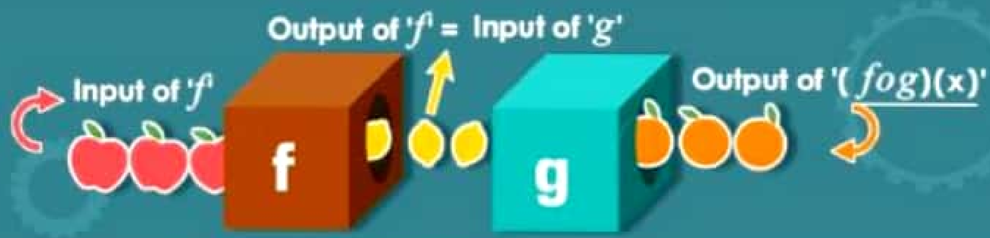
Function 'f' from set A to set B is Bijective Function if

(a) 'f' is One one function

(b) 'f' is Onto function.

SPECIAL FUNCTIONS

COMPOSITE FUNCTION



"Function Composition" means applying one function to the results of another.

PROPERTIES OF COMPOSITE FUNCTIONS

- The composite of functions is not commutative. $(gof)(x) \neq (fog)(x)$
- The composite of functions is associative. if f, g, h are three functions Then $fo(goh) = (fog)oh$
- The composite of two bijections is a bijection. if f and g are two bijections such that gof is defined, then gof is also a bijection.

INVERSE FUNCTION

Let f : A → B be a bijective function, then there exists a unique g : B → A such that $f(x) = y \Leftrightarrow g(y) = x$, for all $x \in A$ and $y \in B$. Then 'g' is said to be inverse of 'f'.

PROPERTIES OF INVERSE FUNCTION

- The inverse of a bijection is unique.
- If f : A → B is a bijection and g : B → A is the inverse of f, then $fog = I_B$ and $gof = I_A$, where I_A and I_B are identity functions on the sets A and B respectively.
- The inverse of a bijection is also a bijection.
- If f & g are two bijections ; f : A → B, g : B → C then the inverse of gof exists and $(gof)^{-1} = f^{-1}og^{-1}$.