HOW TO TEACH

MATH MCQs

M. MAQSOOD ALI

For Class XII

$$4x^2 + 9y^2 = 36$$
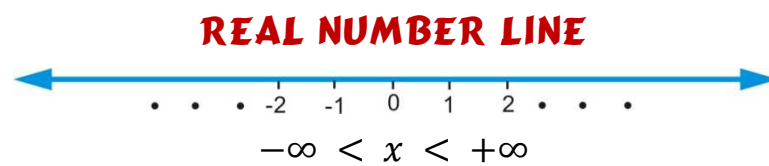
a. ◯ b. ∨

c. ⬭ d. ⟩⟨

BOOK - 2

ISBN 978-969-9159-03-9

Chapter 1

FUNCTIONS

REAL NUMBER LINE

$$-\infty < x < +\infty$$

SETS AND INTERVALS

(i) $\{a, b\}$

It is a set and a and b are the elements of the set.

(ii) $[a, b]$

It is a closed interval.

If $x \in [a, b]$, then $a \leq x \leq b$.

(iii) (a, b)

It is an open interval.

If $x \in (a, b)$, then $a < x < b$.

MCQ-1:

If $x \in (5,8)$, then_____?

(a) $x = 5, 8$ only   (b) $5 \leq x \leq 8$

(c) $5 < x < 8$ (d) $x \leq 5$ and $x \geq 8$

Solution:

(5,8)

All real numbers between 5 and 8 but 5 and 8 are not including, so

$$5 < x < 8$$

The answer is (c)

2

EXERCISE-1

(1) If $x \in \{3,10\}$, then which of the following is true?

     (a) $x = 3 , 10$ only   (b) $3 \leq x \leq 10$

     (c) $3 < x < 10$ (d) $x \leq 3 , x \geq 10$

(2) If $x \epsilon [6,7]$, then which of the following is true?

     (a) $x = 6 , 7$ only   (b) $6 \leq x \leq 7$

     (c) $6 < x < 7$ (d) $x < 6 , x > 7$

(3) If $x \epsilon (3,9]$, then which of the following is true?

     (a) $x = 3 , 9$ only   (b) $3 \leq x \leq 9$

     (c) $3 \leq x < 9$ (d) $3 < x \leq 9$

GREATEST LOWER BOUND (g.l.b)
AND
LEAST UPPER BOUND (l.u.b)

$$A = \{a, b\} \text{ is a set.}$$

(i)   Lower bounds of A : $x \leq a$

(ii)   Greatest lower bound of $A = a$

(iii)   Upper bounds of A : $x \geq b$

(iv)   Least upper bound of $A = b$

MCQ- 2:

If $B = \{x : 5 \leq x < 7\}$, then what is the least upper bound of B?

     (a) 5   (b) 6   (c) 7   (d) None

Solution:

$$\because \text{upper bounds of } B = x \geq 7$$

$$\therefore l.u.b \ of \ B = 7$$

The answer is (c).

EXERCISE-2

(1) If $B = \{3,6,9,10\}$ is a set, then upper bounds of $B = x =$?

    (a) $x = 10$ only   (b) $x \geq 10$ (c) $x \leq 3$ (d) $x = 3$ only

(2) If $B = \{5,6,7,8\}$, then least upper bound of $B = x =$?

    (a) $x = 5$ (b) $x = 8$ (c) $x \leq 5$ (d) $x \geq 8$

(3) If $B = \{-3,1,5\}$, then greatest lower bound of $B = x =$?

    (a) $x = -3$ (b) $x = 5$ (c) $x \leq -3$ (d) $x \geq 5$

(4) If $B = \{-5,6,12\}$, then lower bounds of $B = x =$?

    (a) $x = -5$ only   (b) $x = 12$ only   (c) $x \leq -5$ (d) $x \geq 12$
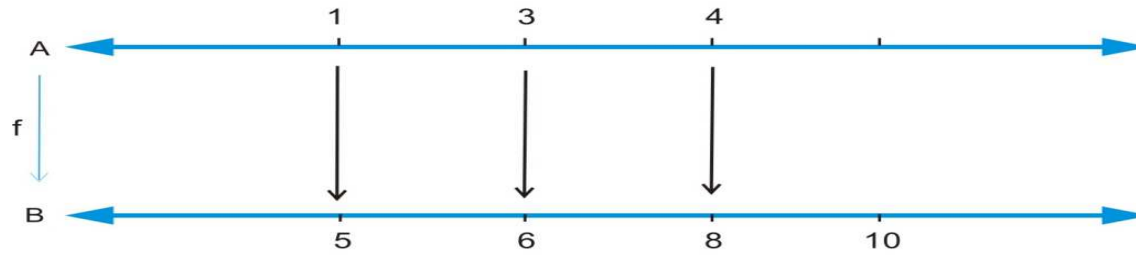
FUNCTIONS

Definition 1:

A function f assigns to each element x of set A an element $f(x)$ of another set B.
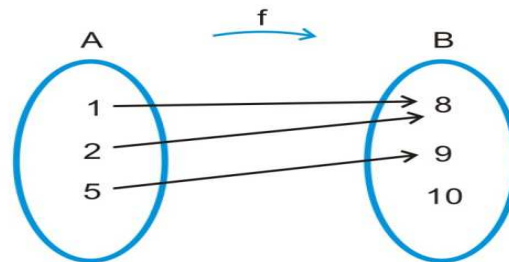
$$f : A \rightarrow B \ , \ \forall \, x \in A \ \text{ and } \ f(x) \in B$$

Explanation with Mapping: (Different style of mapping)
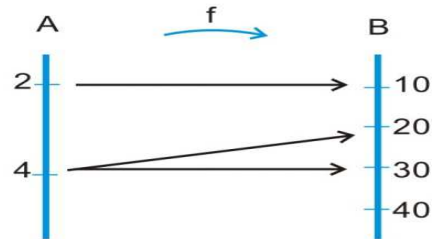
(1)   f is a function A into B.
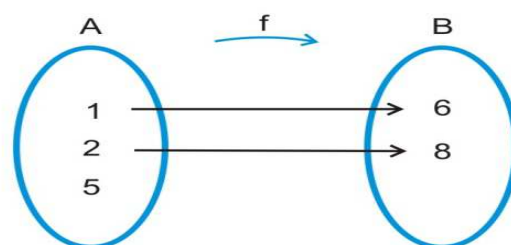

(2)   f is a function A into B.

(3)   f is not a function A into B.

because f(4)=20 and f(4)=30.
4 has two images 20 and 30.

(4)   f is not a function A into B.

because 5 has no image.

5

RELATIONS

A relation is a set of ordered pairs.

or

Any subset of the set of Cartesian product $A \times B$ is called relation.

Examples:

If $A = \{1,3,5\}$ and $B = \{2,4,6\}$ then the following subsets are relation between A and B.

(i) $\{(1,2),(1,4),(2,6)\}$

(ii) $\{(3,4),(1,6),(3,4),(5,6)\}$

FUNCTIONS

Definition 2:

A relation f of between A and B is called a function if every $x \in A$ there is exactly one $y \in B$.

The element y is denoted by $f(x)$.

Examples:

If $A = \{1,3,5\}$ and $B = \{2,4,6\}$ then the following subsets are relations are the functions A into B.

Examples:

(i) $f = \{(1,2),(3,4),(5,6)\}$

(ii) $f = \{(1,4),(3,6),(5,4)\}$

(iii) $f = \{(1,2),(3,2),(5,2)\}$

(iv) $f = \{(1,2),(3,4),(5,6)\}$

Following are not functions from A into B.

(i) $f = \{(1,2),(3,4),(3,6),(5,6)\}$

because 3 has two images 4 and 6.

(ii) $f = \{(1,2),(3,6)\}$

because image of 5 does not exist.

MCQ- 3:

$f: A \rightarrow B$ is a function such that $A = \{2,5\}$ and $B = \{3,8,9\}$.

Which of the following is correct?

    (a) $f = \{\,(\,2\,,3\,)\,,(5\,,9\,)\,\}$ (b) $f = \{\,(\,2\,,3\,)\,,(\,2\,,5\,)\,\}$

    (c) $f = \{\,(\,2\,,3\,)\,,(\,5\,,8\,)\,,(\,5\,,9\,)\,\}$ (d) $f = \{\,(\,5\,,8\,)\,\}$

Solution:

> Option (a) : Each element of set A has an element in set B.

The answer is (a).

Explanation:

Options (b), (c) and (d) are not correct because

Option (b) :　$\{(2,3),(2,5)\}$

          $2 \,\epsilon\, A$ has two images in set B,

          that are 3 and 5

option (c) :　$\{(2,3),(5,8),(5,9)\}$

          $5 \,\epsilon\, A$ has two images in set B,

          that are 8 and 9.

option (d) : $\{(5, 8),\quad\}$ (2, ?)

          $2 \in A$ has no image in B, such that (2, ?).

MCQ- 4:

If $f: \mathbb{N} \rightarrow \mathbb{N}$, then which of the following is correct?

    $(a)\ f(x) = \frac{1}{2}x^2$ (b) $f(x) = \sqrt{x} + 3$

    (c) $f(x) = x^3 + 3$ (d) $f(x) = x^2 - 1$

Solution:

> $f: \mathbb{N} \rightarrow \mathbb{N}$

> $\therefore f(x) \in \mathbb{N} = \{1,2,3, \dots \}$
>
> Option(c):

$$x^3 \epsilon \mathbb{N} \qquad , \quad \forall\ x\epsilon\mathbb{N}$$
$$\text{and} \quad (x^3 + 3)\ \epsilon\ \mathbb{N} \quad , \quad \forall\ x\epsilon\mathbb{N}$$

The answer is (c).

Explanation:

Option(a) :   check at 3

$$f(3) = \frac{1}{2} \times 3^2 = \frac{9}{2} \notin \mathbb{N}$$

Option b : $f\ (5)\ = \sqrt{5} + 3 \notin \mathbb{N}$

Option d : $f\ (1)\ = 1^2 - 1 = 0 \notin\ \mathbb{N}$

EXERCISE-3

(1) $A = \{1,3,6\}$, $B = \{5,8\}$ and $f : A \to B$.

   Which of the following is a function?

   (a) $f = \{(1,5),(3,8),(3,5)\}$ (b) $f = \{(1,8),(3,5)\}$

   (c) $f = \{(6,5),(1,8),(3,3)\}$ (d) $f = \{(1,5),(3,5),(6,5)\}$

(2)   If $f : \mathbb{N} \to \mathbb{Z}$, then which of the following is true?

   (a) $f(x) = \frac{1}{2}(2x + 1)$ (b) $f(x) = 2x^3 - 15x$

   (c) $f(x) = \sqrt{x + 2}$ (d) $f(x) = x + \sqrt{x}$

VALUE OF THE FUNCTION

If f is a function $f: A \rightarrow B$

(i) $f(a)$ is the value of the function at $x = a$,

   if $a \in A$ and the value of the function exist if $f(a) \in B$.

(ii) $f(a)$ is not the value of the function at $x = a$,

   if $a \notin A$.

MCQ- 5:

If $f: \mathbb{R} \rightarrow \mathbb{R}$ is given by

$$f(x) = \sqrt{x}$$

then $f(16) =?$

   (a) 16   (b) 2   (c) 4   (d) 8

Solution:

$$f(x) = \sqrt{x}$$

$$f(16) = \sqrt{16}$$

$$= 4$$

The answer is (c).

MCQ-6:

If $f: \mathbb{Z} \rightarrow \mathbb{R}$ is defined by

$$f(x) = \begin{cases} 2 + x^2 & when \quad x \in \mathbb{Z}^+ \\ 5 - x & when \quad x \in \mathbb{Z}^- \end{cases}$$

then $f(-6) =?$

   (a) 49   (b) 38   (c) 0   (d) 11

Solution:

$\mathbb{Z}$: set of integers

$\mathbb{Z}^-$: set of negative integers

$\mathbb{Z}^+$: set of positive integers

$$\because -6 \in \mathbb{Z}^-$$

$$\therefore f(x) = 5 - x$$

$$f(-6) = 5 - (-6)$$

$$= 11$$

The answer is (d).

MCQ- 7:

$$If \quad f: \mathbb{N} \to \mathbb{R} \quad is\ defined\ by$$

$$f(x) = 8x^2 + 3$$

then $f(-2) =$?

    (a) -29 (b) 35   (c) 0   (d) None

Solution:

$$\mathbb{N} = \{1,2,3,4, \dots\}$$

$\mathbb{N}$ is the set of natural numbers.

$$-2 \notin \mathbb{N} \quad and \quad f: \mathbb{N} \to \mathbb{R}$$

$$\therefore f(-2) \text{ does not exist.}$$

The answer is (d).

MCQ- 8:

If $f: [-3,8] \to \mathbb{R}$ is defined by

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

then $f(9) =$?

    (a) 3   (b) 21   (c) 9   (d) None

Solution:

$$f: [-3,8] \to \mathbb{R}$$

$$9 \notin [-3,8]$$

$$\therefore f(9) \text{ does not exist.}$$

The answer is (d).

EXERCISE-4

(1)   A function $f : [2,8] \to \mathbb{R}$ is defined by $f(x) = 2x^3 - 5$.

What is the value of f(1)?

(a) 12   (b) 6   (c) -3   (d) None

(2)   A function $f : [6,12] \to \mathbb{N}$ is defined by $f(x) = 2x^2 + 6x$.

What is the value x when $f(x) = \frac{7}{2}$?

(a) $-1/2$ (b) 5/2   (c) 3/2   (d) $-7/2$

(3)

$$f(x) = \begin{cases} 2x^2 - 1 & , \quad 2 \le x < 5 \\ x^2 + 2 & , \quad 5 \le x \le 10 \end{cases}$$

$f(5) =$?
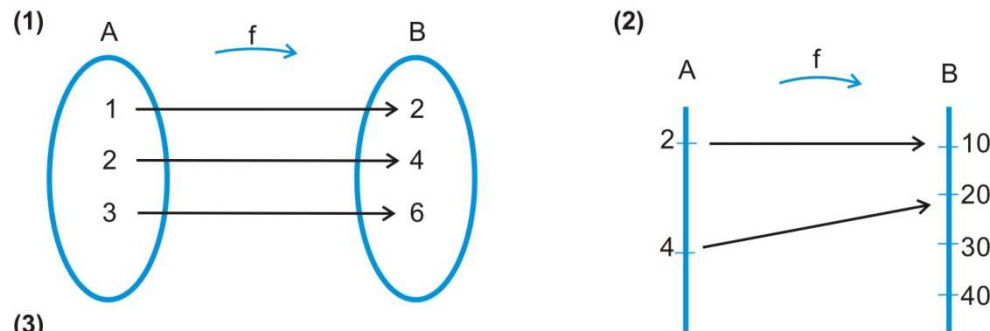
(a) 27   (b) 49   (c) 76   (d) None

ONE TO ONE FUNCTIONS

A function $f: A \rightarrow B$ is said to be one to one if $x_1 \neq x_2$ implies that $f(x_1) \neq f(x_2)$ such that $x_1, x_2 \in A$ and $f(x_1), f(x_2) \in B$.

Examples:

  (a) Following functions are one to one functions.

(1)

(2)

(3)
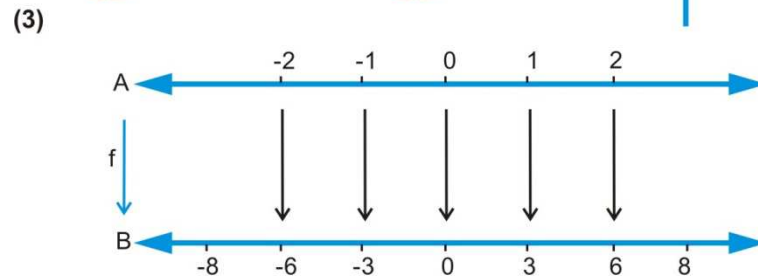
  (4) If A = {1, 2, 4} and B = {1, 10, 20}

      and f = {(1, 1), (2, 10), (4, 20)}
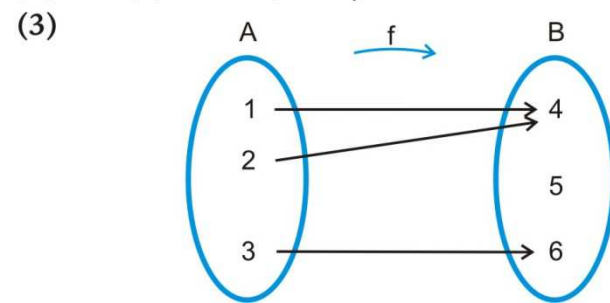
  (5) f(x) = 5x , $\forall$ x $\in \mathbb{R}$

  (6) f(x) = x² + 3x , $\forall$ x $\in \mathbb{R}$

  (b) Following functions, are not one - one functions.

  (1) f(x) = |x|

  (2) f(x) = 6 (or any constant function)

  (3)

12

MCQ- 9:

If $f: A \rightarrow B$ such that $A = \{2,6,8\}$ and $B = \{1,3,5,7,9\}$ then which of the following is one to one function?

(a) $f = \{(2,1),(8,3),(6,1)\}$ (b) $f = \{(2,3),(8,7),(6,5),(2,9)\}$

(c) $f = \{(2,1),(8,9)\}$ (d) $f = \{(2,1),(8,9),(6,5)\}$

Solution:

Option(d) : $\{(2,1),(8,9),(6,5)\}$

f is a function and the images of 2,8 and 6 are different.

$\therefore f$ is one to one.

The answer is (d).

Explanation:

Option (a) : $\{(2,1),(8,3),(6,1)\}$

f is not one to one, the images of 2 and 6 are same.

Option (b) : $\{(2,3),(8,7),(6,5),(2,9)\}$

f is not a function.

$\because$ 2 is repeated in the domain.

Option (c) : $\{(2,1),(8,9)\}$ (6, ?)

$\Rightarrow f(6)$ does not exist.
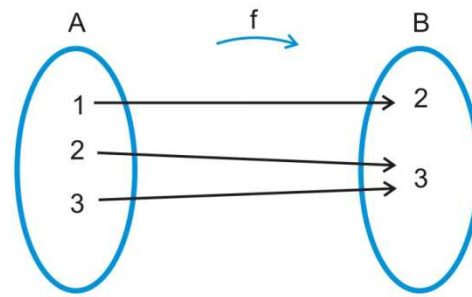
$\therefore f$ is not a function.

ONTO FUNCTIONS

A function $f: A \rightarrow B$ is said to be onto if for every $y \in B$ there is some $x \in A$ such that $y = f(x)$.
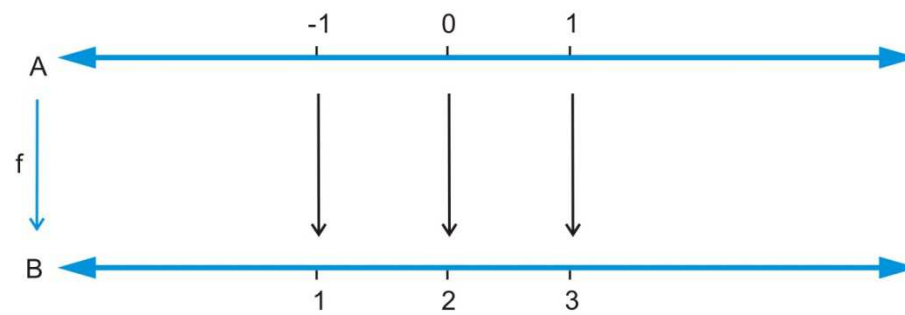
Examples:

(A)   Following functions are onto functions.

(1)

because each element of B is the image of some element of A, under f.
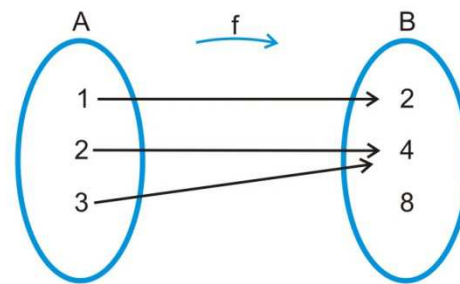
(2)

because each element of B is the image of an element of A under f.

(B)   Following functions are not onto functions.

(1)

because 8 $\in$ B is not the image of any element of A under f.

MCQ- 10:

If $f: A \rightarrow B$ such that $A = \{5,6,7\}$ and $B = \{2,4\}$ then which of the following is onto function?

(a) $f = \{(5,2), (6,4)\}$ (b) $f = \{(5,2), (6,2), (7,4)\}$

(c) $f = \{(5,2), (6,4), (6,2)\}$ (d) $f = \{(5,2), (6,2), (7,2)\}$

Solution:

Option (b) f is a function and onto.

Because all the elements in B are the images of the elements in A.

The answer is (b).

Explanation:

Option (a) and option (c) are not functions.

Option (d) is a function but not onto because for 4 ϵ B

is not the image of any element in A.
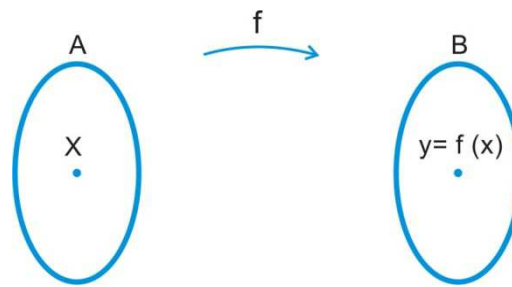
EXERCISE-5

	AUTHOR M. MAQSOOD ALI ASSISTANT PROFESSOR OF MATHEMATICS	FREE DOWNLOAD ALL BOOKS AND CD ON MATHEMATICS BY M. MAQSOOD ALI FROM WEBSITE www.mathbunch .com

COMPOSITE FUNCTIONS

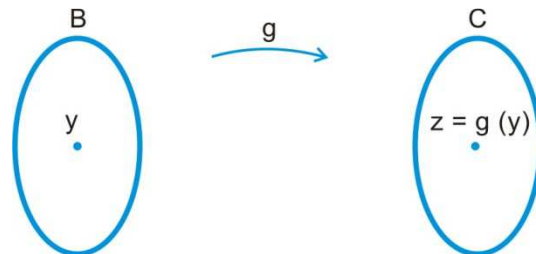Suppose that A, B and C are three sets. Let f be function A into B

$$y = f(x), \quad \forall x \in A \; where \; y \in B.$$

Geometrically it can be represented as

Let g be a function B into C, then

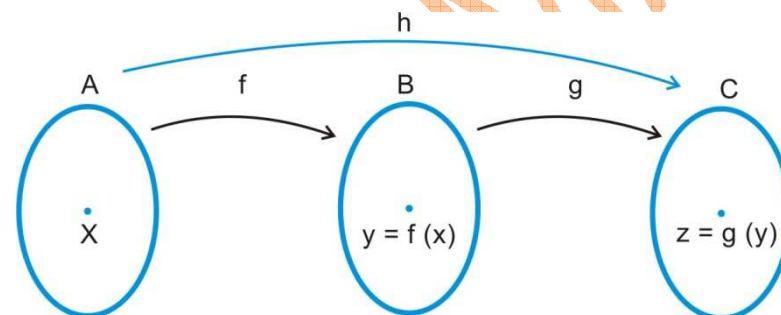$$z = g(y), \quad \forall \, y \in B \; where \; z \in C$$

h is a new function A into C defined as

$$h(x) = g[f(x)]$$

is called composite function.

Geometrically it can be represented as

The composite function $g[f(x)]$ is written as

$$(g_o f)(x)$$

read "g composed with f ".

16

Shortcut"

(i) $f_o g = f(g)$

(ii) $g_o f = g(f)$

(iii) $f_o f = f(f)$

MCQ- 11:

If $f(x) = 5x - 3$ and $g(x) = 2x^2$, then $fog =$?

    (a) $10x^2 - 3$ (b) $10x^3 - 6x^2$ (c) $2(5x - 3)^2$ (d) $2x^2 + 5x - 3$

Solution:

$$fog = f(g)$$

$\qquad = 5g - 3$ {Replace x with g

$\qquad = 5(2x^2) - 3$ {Put the value of $g(x)$

$\qquad = 10x^2 - 3$

The answer is (a).

EXERCISE-6

	AUTHOR M. MAQSOOD ALI ASSISTANT PROFESSOR OF MATHEMATICS	FREE DOWNLOAD ALL BOOKS AND CD ON MATHEMATICS BY M. MAQSOOD ALI FROM WEBSITE www.mathbunch .com

17

POLYNOMIAL FUNCTIONS

A function is of the form

$$P(x) = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_1 x + a_0$$

is called polynomial function in x of degree n, where n is non-negative integer and the highest power of x, where $a_0, a_{n-1}, \ldots, a_1, a_0$ are real numbers.

Particular Polynomial Functions:

(i)   If $n = 0$ $\Rightarrow$ $P(x) = a_0$ (constant function, degree 0)

(ii) If $n = 1$ $\Rightarrow$ $P(x) = a_1 x + a_0$ (linear function, degree 1)

(iii) If $n = 2$ $\Rightarrow$ $P(x) = a_2 x^2 + a_1 x + a_0$ (quadratic function, degree 2)

MCQ- 12:

Which of the following is a polynomial function?

(a) $f(x) = 2x + \sqrt{x}$ (b) $f(x) = \dfrac{3}{2} x^2 + 2x$

(c) $f(x) = 5x^{\frac{2}{3}} + 2$ (d) $f(x) = 2x^{-3} + 6x^2$

Solution:

Option(b):   the powers of x are non-negative integers.

The answer is (b).

MCQ-13 :

What is the degree of the polynomial function $f(x) = 5x^4 + 3x^2 + 9x$?

(a) 5   (b) 9   (c) 4   (d) 1

Solution:

The highest power of x is 4.

The degree of the polynomial function is 4.

The answer is (c).

EXERCISE-7

(1)   Which of the following is a polynomial function?

(a) $f(x) = 5$ (b) $f(x) = 2\sqrt{x} + 3$

(c) $f(x) = \dfrac{2}{x^2} + 7x$ (d) $f(x) = 5x^{-6} + 6$

EVEN FUNCTIONS

A function is said to be even function, if

$$f(-x) = f(x)$$

ODD FUNCTIONS

A function is said to be odd function, if

$$f(-x) = -f(x)$$

Note:

(1) $f(x) = g(x) + h(x) + t(x) + \cdots$

    (i) f is even function if g, h, t ... are even functions.

    (ii) f is odd function if g, h, t ... are odd functions.

(2) $f(x) = g(x).f(x)$

    (i) f is even function if g and h both are even or both are odd functions.

    (ii) f is odd function if one of them g or h are odd function and other is even function.

(3) $f(x) = \dfrac{g(x)}{f(x)}$

    (i) f is even function if g *and* h both are even or both are odd functions.

    (ii) f is odd function if one of them g or h are odd function and other is even function.

(4)   A constant function is an even function.

MCQ- 14:

Which of the function is an odd function?

(a) $f(x) = x^3 + 5$ (b) $f(x) = 2x^2$

(c) $f(x) = 3x^3 + sinx$ (d) $f(x) = x^5 + \cos x$

Solution:

$$f(x) = 3x^3 + \sin x$$

$$f(-x) = 3(-x)^3 + \sin(-x)$$
$$= -3x^3 - \sin x$$
$$= -(3x^3 + \sin x)$$
$$= -f(x)$$

The answer is (c).

Shortcut:

> Since x^3 and $sinx$ are odd functions.
> So that $f(x)$ is an odd function.

The answer is (c).

Explanation:

Option (a) : There is a constant term 5 , so it can not be an odd
function.

Option (b) : The power of x is an even number , which is 2 , so it is not
an odd function.

option (d) : $cos(-x) = cosx \neq -cosx$
$\therefore$ it is not an odd function.

Option (c) : the power of x is odd number, that is 3 so $(-x)^3 = -x^3$ and
$sin(-x) = -sinx$.
So f is an odd function.

EXERCISE-8

(1) Which of the following is neither even nor odd function?

(a) $f(x) = 3x^3 + 2x$ (b) $f(x) = 2x^2 + 9$

(c) $f(x) = 5x^3 + 6$ (d) $f(x) = x^2 + cosx$

AUTHOR

M. MAQSOOD ALI

ASSISTANT PROFESSOR OF MATHEMATICS

FREE DOWNLOAD

ALL BOOKS AND CD ON MATHEMATICS

BY

M. MAQSOOD ALI

FROM WEBSITE

www.mathbunch.com