



# GAIL DAV PUBLIC SCHOOL DIBIYAPUR

## ASSIGNMENT: RELATIONS AND FUNCTIONS

CLASS - XII (MATHS)

1. If  $R$  is a relation on the set  $A = \{1, 2, 3, 4\}$  given by  $R = \{(a, b) : |a-b| \text{ is even}\}$ , which of the following is true?

- (a)  $R$  is not reflexive
- (b)  $R$  is not symmetric
- (c)  $R$  is an equivalence relation
- (d)  $R$  is not transitive

2. Let  $X = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ . Relation  $R_1$  on  $X$  is defined by

$R_1 = \{(x, y) : x - y \text{ is divisible by } 3\}$ . Which of the following is an equivalence class of 1 of this relation?

- (a)  $\{1, 3, 5\}$
- (b)  $\{1, 4, 7\}$
- (c)  $\{2, 4, 6\}$
- (d)  $\{3, 5, 7\}$

3. A function  $f: X \rightarrow Y$  is defined where  $X = \{a, b, c\}$  and  $Y = \{1, 2\}$ . How many onto functions (surjections) are possible from  $X$  to  $Y$ ?

- (a) 6
- (b) 8
- (c) 9
- (d) 12

4. Consider the function  $f: \mathbb{R} \rightarrow \mathbb{R}$  given by  $f(x) = x^3$ . This function is:

- (a) only one-one
- (b) only onto
- (c) one-one and onto
- (d) neither one-one nor onto

5. Let  $A = \{1, 2, 3\}$ . How many reflexive relations can be defined on  $A$ ?

- (a)  $2^9$
- (b)  $2^6$
- (c)  $2^3$
- (d)  $2^0$

6. If  $f(x) = \frac{\log(2x+1)}{\sqrt{3-x}}$ , the domain of  $f$  is:

- (a)  $\mathbb{R}$
- (b)  $\left(-\frac{1}{2}, \infty\right)$
- (c)  $\mathbb{R} - \{3\}$
- (d)  $\left(-\frac{1}{2}, 3\right)$

7. The function  $f: \mathbb{R} \rightarrow \mathbb{R}$  defined by  $f(x) = |x|$  is:

- (a) one-one but not onto
- (b) onto but not one-one
- (c) both one-one and onto
- (d) neither one-one nor onto

8. A relation  $R$  on set  $\mathbb{N}$  of natural numbers is defined as  $R = \{(x, y): y = x + 5 \text{ and } x < 4\}$ . Then  $R$  is:

- (a) reflexive
- (b) symmetric
- (c) transitive
- (d) not transitive

9. Let  $R$  be a relation on the set  $\mathbb{Z}$  of integers given by  $aRb \Leftrightarrow a = 3^k b$  for some integer  $k$ . Then,  $R$  is:

- (a) Reflexive
- (b) Symmetric
- (c) Transitive

**(i)** only (a) and (b)    **(ii)** only (c) and (b)    **(iii)** only (a) and (b)    **(iv)** (a), (b) and (c)

10. The relation  $R$  in the set  $\{1, 2, 3\}$  given by  $R = \{(1, 2), (2, 1), (1, 1)\}$  is:

- (a) symmetric and transitive, but not reflexive

- (b) reflexive and symmetric, but not transitive
- (c) symmetric, but neither reflexive nor transitive
- (d) an equivalence relation

**11.** If  $f(x) = x^2 - 3x + 2$ , then  $f(f(x))$  is:

- (a) a quadratic polynomial
- (b) a biquadratic polynomial
- (c) a linear polynomial
- (d) a constant

**12.** Given below is a relation  $R$  from the set  $X = \{x, y, z\}$  to itself.

$$R = \{(x, x), (x, y), (y, x), (y, z), (x, z)\}.$$

Which of the following is true about  $R$ ?

- (a)  $R$  is reflexive and transitive but not symmetric.
- (b)  $R$  is symmetric and transitive but not reflexive.
- (c)  $R$  is transitive but neither reflexive nor symmetric.
- (d)  $R$  is not reflexive, not symmetric and not transitive.

**13.** The function  $f: \mathbb{R} \rightarrow \mathbb{R}$  defined by  $f(x) = x^2 - 4x + 5$  then the range of  $f$  is?

- (a)  $\mathbb{R}$
- (b)  $[1, \infty)$
- (c)  $[4, \infty)$
- (d)  $[5, \infty)$

**14.** Which of the following is an equivalence relation on the set  $A = \{1, 4, 9\}$ ?

- (a)  $R_1 = \{(1, 1), (4, 4), (9, 9)\}$
- (b)  $R_2 = \{(1, 1), (4, 4), (1, 4), (4, 1)\}$
- (c)  $R_3 = \{(4, 4), (9, 9), (1, 1), (9, 1), (1, 9), (1, 4), (4, 1)\}$
- (d)  $R_4 = \{(1, 4), (4, 4), (9, 4), (4, 1), (1, 1), (9, 9), (9, 1)\}$

**15.** If  $f(x) = x^3 + 1$  and  $f(g(x)) = x$ , then what is  $g(1)$ ?

- (a) 0
- (b) 1
- (c) 2

(d) cannot be determined

**16.** Let  $f: X \rightarrow X$  be a function on a finite set  $X$ . Consider the statements:

(i) If  $f$  is onto, then  $f$  is one-one.

(ii) If  $f$  is one-one, then  $f$  is onto.

Which of the following is correct?

(a) Both (i) and (ii) are true.

(b) (i) is true but (ii) is false.

(c) (i) is false but (ii) is true.

(d) Both (i) and (ii) are false.

**17.** The number of possible reflexive relations on a set consisting of 3 elements is?

(a) 512

(b) 64

(c) 256

(d) 128

**18.** If  $A = \{1,2,3\}$  and  $B = \{a, b\}$ , then the number of functions from  $A$  to  $B$  is :

(a) 3

(b) 6

(c) 8

(d) 12

**19.** A function  $f: \mathbb{R} \rightarrow A$  is defined by  $f(x) = x^2 + 2$ , is onto, if  $A$  is:

(a)  $(-\infty, \infty)$

(b)  $(2, \infty)$

(c)  $[2, \infty)$

(d)  $[-2, \infty)$

**20.** The number of relations that can be defined on a set with  $n$  elements is:

(a)  $n^2$

(b)  $n^n$

(c)  $2^{n^2}$

(d)  $n^2$

**21. Assertion (A):** The relation  $R$  on set  $A = \{1, 2, 3\}$  defined as  $R = \{(1, 2), (2, 1)\}$  is symmetric but not transitive.

**Reason (R):** For transitivity, if  $(a, b) \in R$  and  $(b, c) \in R$ , then  $(a, c)$  must also be in  $R$ . Here,  $(1, 2)$  and  $(2, 1) \in R$  but  $(1, 1) \notin R$ .

- (a) Both (A) and (R) are true and (R) is the correct explanation for (A).
- (b) Both (A) and (R) are true but (R) is not the correct explanation for (A).
- (c) (A) is true but (R) is false.
- (d) Both (A) and (R) are false.

**22.** Let a function  $f: \mathbb{N} \rightarrow \mathbb{N}$  be defined by  $f(x) = x^2 - x + 1$

**Assertion (A):**  $f$  is one-one.

**Reason (R):**  $f$  is onto.

- (a) Both (A) and (R) are true and (R) is the correct explanation for (A).
- (b) Both (A) and (R) are true but (R) is not the correct explanation for (A).
- (c) (A) is true but (R) is false.
- (d) Both (A) and (R) are false.

**23. Assertion (A):** The function  $f: \mathbb{R} \rightarrow \mathbb{R}$  given by  $f(x) = 5x^3 + 4$  is invertible.

**Reason (R):** A function is invertible if and only if it is one-one and onto.

- (a) Both (A) and (R) are true and (R) is the correct explanation for (A).
- (b) Both (A) and (R) are true but (R) is not the correct explanation for (A).
- (c) (A) is true but (R) is false.
- (d) Both (A) and (R) are false.

**24. Assertion (A):** A function  $f: \mathbb{Z} \rightarrow \mathbb{Z}$  defined as  $f(x) = x^2 - 4$  is injective.

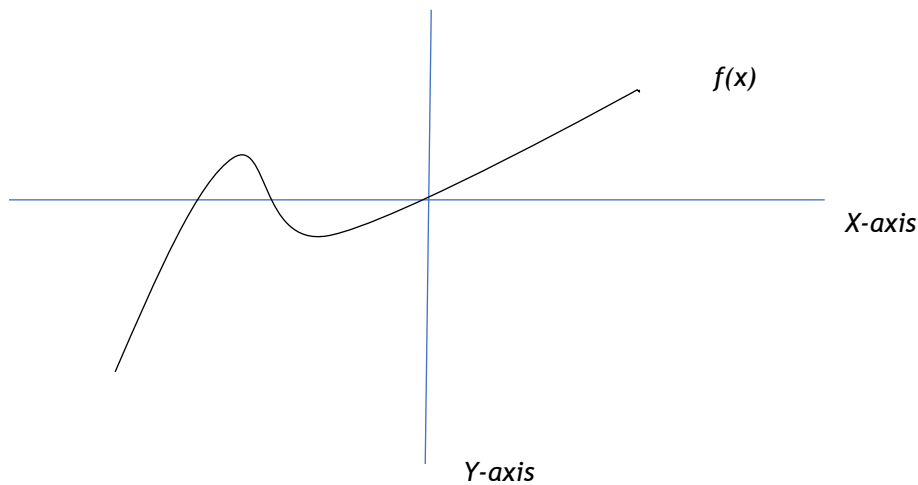
**Reason (R):** A function  $f: A \rightarrow B$  is said to be injective if every element of  $A$  has distinct image in set  $B$ .

- (a) Both (A) and (R) are true and (R) is the correct explanation for (A).
- (b) Both (A) and (R) are true but (R) is not the correct explanation for (A).
- (c) (A) is true but (R) is false.
- (d) Both (A) and (R) are false.

**25.** Find the domain of  $f(x) = \sqrt{x^2 - 6x + 5}$ .

**26.** If  $f\left(x - \frac{1}{x}\right) = x^2 + \frac{1}{x^2}$  then  $f(2)$ .

27. Observe the following plot of function  $f(x)$  and determine whether or not it is one-one.



28. A school library has a collection of books. A relation  $R$  is defined on the set of all books in the library as  $R = \{(x, y) : x \text{ and } y \text{ have the same number of pages}\}$ . Show that  $R$  is an equivalence relation. Find the set of all books related to a book titled "Mathematics".

29. Let  $f: \mathbb{N} \rightarrow Y$  be a function defined as  $f(x) = 4x + 3$ , where  $Y = \{y \in \mathbb{N} : y = 4x + 3 \text{ for some } x \in \mathbb{N}\}$ . Show that  $f$  is invertible. Find the inverse.

30. Let  $A = \mathbb{R} - \{3\}$  and  $B = \mathbb{R} - \{1\}$ . Consider the function  $f: A \rightarrow B$  defined by  $f(x) = (x-2)/(x-3)$ . Is  $f$  one-one and onto? Justify your answer.

31. Check whether the relation  $R$  in  $\mathbb{R}$  (set of real numbers) defined by  $R = \{(a, b) : a \leq b^3\}$  is reflexive, symmetric or transitive.

32. Show that the relation  $R$  in the set  $A = \{x \in \mathbb{Z} : 0 \leq x \leq 12\}$  given by

$R = \{(a, b) : |a - b| \text{ is a multiple of } 4\}$  is an equivalence relation. Find the set of all elements related to 1.

33. If  $f(x) = x + 1$  and  $g(x) = x^2 + 2x + 3$ , find  $(f \circ g)(x)$  and  $(g \circ f)(x)$ . Are they equal?

34. Show that the function  $f: \mathbb{R} \rightarrow \mathbb{R}$  such that  $f(x) = x^3 + x + 5$  is one-one and onto.

35. A function  $f: \mathbb{R} - \{-1, 1\} \rightarrow \mathbb{R}$  defined by  $f(x) = \frac{x}{x^2 - 1}$ . Check if  $f$  is one-one and onto and show your work.

36. In a class, a teacher defines a relation  $R$  on the set of students as "x is taller than y". Analyse this relation for its reflexive, symmetric, and transitive properties.

**37.** Let  $X = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ . Prove that the relation  $R$  defined by "x - y is divisible by 3" is an equivalence relation and divides the set into three equivalence classes.

**38.** For the function  $f(x) = (x^2 + 1)/(x - 2)$ , find its domain and range.

**39.** Let  $P$  be a relation  $P: \mathbb{R} \rightarrow \mathbb{R}$  on set of natural numbers defined as  $P = \{(a, b) : \sqrt{a} = b\}$  is a function or not. Justify it.

**40.** Show that the relation  $R$  in the set of real numbers defined as  $R = \{(a, b) : a \leq b\}$  is reflexive and transitive but not symmetric.

**41.** Determine whether the relation  $R$  in the set  $A$  of human beings in a town at a particular time given by  $R = \{(x, y) : x \text{ is father of } y\}$  is reflexive, symmetric or transitive.

**42.** A function  $f$  is defined on set of real numbers as  $f(x) = ax + b$ , such that  $f(1) = 1$  and  $f(2) = 3$ . Find function  $f(x)$ . Hence, check whether function  $f(x)$  is one-one and onto or not.

**43.** Find out the range of the function  $f(x) = \frac{1}{3 - \sin 3x}$  &  $f(x) = \frac{|x-1|}{x-1}$ .

**44.** Let  $f$  be a function defined on set of real numbers defined by  $f(x) = \frac{x}{x^2+1}$   
 $\forall x \in \mathbb{R}$  is neither one-one nor onto.

**45.** Prove that the greatest integer function  $f: \mathbb{R} \rightarrow \mathbb{R}$ , given by  $f(x) = [x]$ , is neither one-one nor onto, where  $[x]$  denotes the greatest integer less than or equal to  $x$ .

**46.** Let  $T$  be the set of all triangles in a plane. A relation  $R$  is defined on  $T$  as  $R = \{(T_1, T_2) : T_1 \text{ is congruent to } T_2\}$ . Show that  $R$  is an equivalence relation.

**47.** If  $f(x) = (4x + 3)/(6x - 4)$ ,  $x \neq 2/3$ , show that  $f \circ f(x) = x$  for all  $x \neq 2/3$ . What is the inverse of  $f$ ?

**48.** A function  $f: A \rightarrow B$ , given by  $f(x) = 2x$  is both one-one and onto. If  $A = \{1, 2, 3, 4\}$  then find the set  $B$ .

**49.** A relation  $R$  on the set  $Z$  of integers is defined as  $(a, b) \in R$  if  $a^2 + b^2 = 25$ . Find the domain and range of  $R$ .

**50.** Match the following list:

	List-I		List-II
(A)	$R = \{ (x, y) : x \text{ and } y \text{ are student of the same school } \}$ is :	(I)	Symmetric
(B)	$R = \{ (L_1, L_2) : L_1 \perp L_2, L_1, L_2 \in L \text{ where } L \text{ is a set of all lines } \}$ is :	(II)	One-one
(C)	A function $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = 2 - 3x$	(III)	Bijjective
(D)	A function $f : [0,1] \rightarrow \mathbb{R}$ defined by $f(x) = 1 + x^2$	(IV)	equivalence



GAIL DAV PUBLIC SCHOOL DIBIYAPUR  
**ASSIGNMENT: INVERSE TRIGONOMETRIC  
FUNCTION**

CLASS - XII (MATHS)

1.  $\sin \left[ \frac{\pi}{3} + \sin^{-1} \left( \frac{1}{2} \right) \right]$  is equal to

- (a) 1            (b)  $\frac{1}{2}$             (c)  $\frac{1}{3}$             (d)  $\frac{1}{4}$

2. The domain of the function  $\cos^{-1} x$  is:

- (a)  $[0, \pi]$     (b)  $(-1, 1)$     (c)  $[-1, 1]$     (d)  $[-\pi/2, \pi/2]$

3. Which of the following is equal to  $\sec^{-1} x$  if  $\sec^{-1}(-x) = \frac{\pi}{8}$

- (a)  $-11/8$     (b)  $\frac{7\pi}{8}$     (c)  $\frac{9\pi}{8}$     (d) Can't be determined without knowing the value of x

4. The domain of the function  $\sin^{-1}(2x)$  is:

- (a)  $[-1, 1]$     (b)  $[0, 1]$     (c)  $\left[ \frac{-1}{2}, \frac{1}{2} \right]$     (d)  $\left( \frac{-1}{2}, \frac{1}{2} \right)$

5. Which of the following is the domain of the function given below?

$$Y = \cos^{-1} \left( \frac{1}{x-1} \right)$$

- (a)  $[-1, 1]$     (b)  $[2, 4]$     (c)  $(-\infty, 2] \cup [4, \infty)$     (d)  $(-\infty, 1] \cup [1, \infty)$

6. The domain of the function  $\sin^{-1} \sqrt{x-1}$  is:

- (a)  $[1, 2]$     (b)  $[-1, 1]$     (c)  $[0, 1]$     (d) none of these

7. The value of the expression  $2 \sec^{-1} 2 + \sin^{-1} \frac{1}{2}$

- (a)  $\frac{\pi}{6}$                       (b)  $\frac{5\pi}{6}$                       (c)  $\frac{7\pi}{6}$                       (d) 1

8. The principal value of  $\cot^{-1}(-1)$  is:

- (a)  $-\frac{\pi}{6}$                       (b)  $\frac{\pi}{4}$                       (c)  $-\frac{\pi}{4}$                       (d)  $\frac{3\pi}{4}$

9. Let  $\theta = \sin^{-1}(\sin(-600^\circ))$ , the value of  $\theta$  is :

- (a)  $-\frac{2\pi}{3}$                       (b)  $\frac{2\pi}{3}$                       (c)  $\frac{\pi}{4}$                       (d)  $\frac{\pi}{3}$

10. If  $f(x) = \cos^{-1}(\sqrt{x^2 - 3})$  then which of the following is present in the domain of  $f(x)$ ?

- (i) 2                      (ii) 1                      (iii) 0                      (iv)  $-\sqrt{3}$

Choose the correct option from the following:

- (a) (i) & (ii)                      (b) (iii) & (ii)                      (c) (iv) & (ii)                      (d) (iv) & (iii)

11. The domain of the function  $y = \cos^{-1}(|x - 1|)$

- (a)  $[0,2]$                       (b)  $[-2,0]$                       (c)  $[-2,2]$                       (d)  $[0,1]$

12. If  $\sin^{-1} \left[ k \tan \left( \cos^{-1} \left( \frac{\sqrt{3}}{2} \right) \right) \right] = \frac{\pi}{3}$  then value of k is:

- (a)  $1/2$                       (b)  $2/3$                       (c)  $1/4$                       (d)  $3/4$

13. The principal value of  $\sec^{-1} \left( \frac{-2}{\sqrt{3}} \right)$  is:

- (a)  $\frac{\pi}{3}$                       (b)  $\frac{\pi}{6}$                       (c)  $\frac{5\pi}{6}$                       (d)  $\frac{2\pi}{3}$

14. The principal value of  $\cot^{-1}(-\sqrt{3})$  is:

- (a)  $\frac{5\pi}{6}$                       (b)  $\frac{\pi}{3}$                       (c)  $\frac{\pi}{2}$                       (d)  $\frac{\pi}{4}$

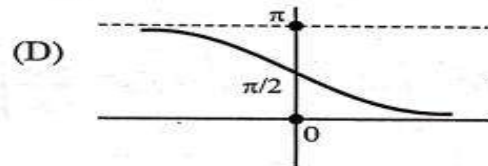
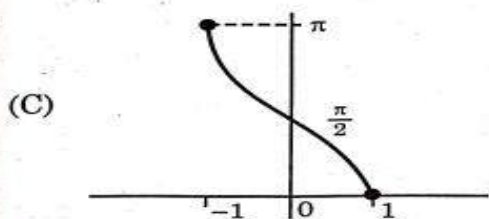
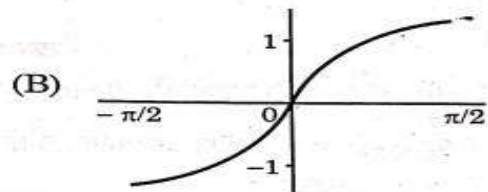
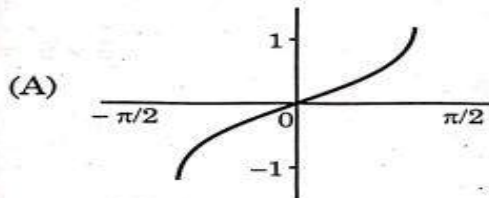
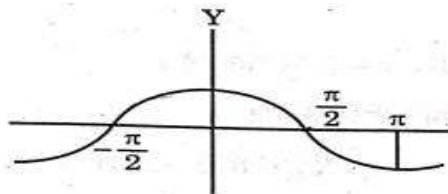
15. If  $\tan^{-1}(\cot \theta) = 2\theta$  then  $\theta$  is equal to

- (a)  $\frac{\pi}{3}$                       (b)  $\frac{\pi}{4}$                       (c)  $\frac{4\pi}{3}$                       (d) None of these

16. If  $y = \tan^{-1} x$  then

- (a)  $-1 < y < 1$       (b)  $-\frac{\pi}{2} < y < \frac{\pi}{2}$       (c)  $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$       (d)  $y \in \left\{-\frac{\pi}{2}, \frac{\pi}{2}\right\}$

17. The graph of a trigonometric function is as shown. Which of the following will represent graph of its inverse?



18. The value of  $\sin^{-1}\left(\sin \frac{3\pi}{5}\right)$  is?

- (a)  $\frac{2\pi}{5}$                       (b)  $\frac{\pi}{5}$                       (c)  $-\frac{2\pi}{5}$                       (d)  $\frac{2\pi}{3}$

19. Assertion (A): A navigation system calculates direction using  $\theta = \cos^{-1}(1.2)$ .

Reason (R): The domain of  $\cos^{-1} \theta$  is  $[-1, 1]$  and values outside this interval are not defined.

- (a) Both (A) and (R) are true and (R) is the correct explanation for (A).  
 (b) Both (A) and (R) are true but (R) is not the correct explanation for (A).  
 (c) (A) is true but (R) is false      (d) Both (A) and (R) are false.

20. Assertion (A): If a robotic arm forms an angle  $\alpha = \cos^{-1}(0.6)$  then  $\alpha$  lies between 0 and  $\pi$ .

Reason (R): The principal value of  $\cos^{-1}\alpha$  is always lies in the range  $[0, \pi]$ .

- (a) Both (A) and (R) are true and (R) is the correct explanation for (A).
- (b) Both (A) and (R) are true but (R) is not the correct explanation for (A).
- (c) (A) is true but (R) is false.
- (d) Both (A) and (R) are false.

21. Assertion (A):  $\sec^{-1}\left(\frac{2}{\sqrt{3}}\right) = \frac{\pi}{6}$ .

Reason (R):  $\cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$ .

- (a) Both (A) and (R) are true and (R) is the correct explanation for (A).
- (b) Both (A) and (R) are true but (R) is not the correct explanation for (A).
- (c) (A) is true but (R) is false.
- (d) Both (A) and (R) are false.

22. Assertion (A): Maximum value of  $(\cos^{-1} x)^2$  is  $\pi^2$ .

Reason (R): Range of the principal value branch of  $\cos^{-1}x$  is  $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ .

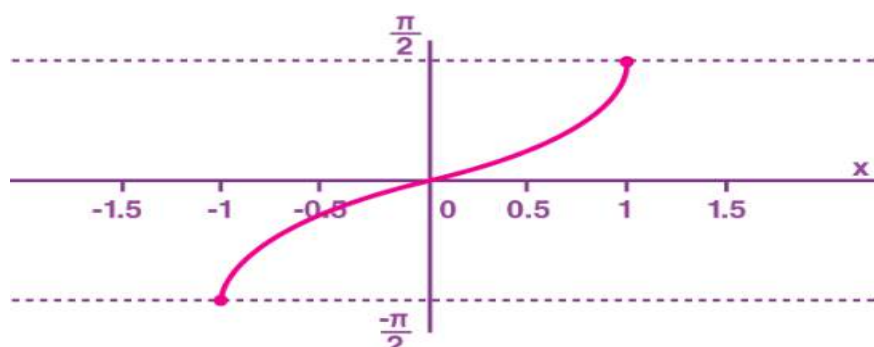
- (a) Both (A) and (R) are true and (R) is the correct explanation for (A).
- (b) Both (A) and (R) are true but (R) is not the correct explanation for (A).
- (c) (A) is true but (R) is false.
- (d) Both (A) and (R) are false.

23. Find the domain & range of  $f(x) = \sin^{-1}(3x)$

24. Raman asked his friend to find the value of  $\tan^{-1}(-x) - \tan^{-1}\left(\frac{1}{x}\right)$ .

Rahul said that the value of the above expression can be found only if  $x$  is known. Is Rahul correct? Justify your answer.

25. identify the given graph.



**26. Assertion (A):** All trigonometric functions have their inverse over their respective domains.

**Reason (R):** The inverse of  $\tan^{-1}x$  exists for some  $x \in \mathbb{R}$ .

- (a) Both (A) and (R) are true and (R) is the correct explanation for (A).
- (b) Both (A) and (R) are true but (R) is not the correct explanation for (A).
- (c) (A) is true but (R) is false.
- (d) Both (A) and (R) are false.

**27.** Express  $\tan^{-1}\left(\frac{\cos x}{1-\sin x}\right)$ , where  $-\frac{\pi}{2} < x < \frac{\pi}{2}$  in the simplest form.

**28.** Solve for  $x$ ,  $2 \tan^{-1} x + \sin^{-1}\left(\frac{2x}{1+x^2}\right) = 4\sqrt{3}$ .

**29.** We know that  $\operatorname{cosec} x = \frac{1}{\sin x}$ . For  $x \in \mathbb{R}$  where  $\operatorname{cosec}^{-1} x$  and  $\sin^{-1} x$  are defined, is  $\operatorname{cosec}^{-1} x = \frac{1}{\sin^{-1} x}$ ? If not, write the correct statement.

**30.** Find the range of  $\cot^{-1}\left[\sqrt{\frac{3}{2}}(\sin x - \cos x)\right]$ .

**31.** Find the value of  $\sin^{-1}\left(\cos\left(\frac{33\pi}{5}\right)\right)$ .

**32.** Evaluate:  $\sin\left[2 \cot^{-1}\left(\frac{5}{12}\right)\right]$ .

**33.** Express  $\sin^{-1}\left(\frac{\sin x + \cos x}{\sqrt{2}}\right)$ , where  $-\frac{\pi}{4} < x < \frac{\pi}{4}$  in the simplest form.

**34.** Solve for  $x$ ,  $\sin^{-1}(1-x) - 2 \sin^{-1}(x) = \frac{\pi}{2}$ .

**35.** Find  $x$ , if  $\sin\left(\sin^{-1}\frac{1}{5} + \cos^{-1} x\right) = 1$



GAIL DAV PUBLIC SCHOOL DIBIYAPUR  
**ASSIGNMENT: MATRICES**  
CLASS - XII (MATHS)

1. If  $A = \begin{bmatrix} 2 & 0 & b \\ 0 & a & 0 \\ 0 & o & 2 \end{bmatrix}$  is a scalar matrix then the value of  $(a + b)(a - b)$  equals

- (a) 0            (b) -4            (c) 4            (d) 1

2. The matrix  $P = \begin{bmatrix} 0 & 0 & 3 \\ 0 & 3 & 0 \\ 3 & o & 0 \end{bmatrix}$  is a

- (a) Diagonal matrix    (b) Square matrix    (c) Unit matrix    (d) Scalar Matrix

3. The number of all scalar matrices of order 3, with entry -2,0 or 2 is:

- (a) 3            (b) 2            (c) 1            (d) Can't be determined

4. If a matrix has 36 elements, the number of possible orders it can have, is:

- (a) 13            (b) 3            (c) 5            (d) 9

5. If  $\begin{bmatrix} 2a + b & a - 2b \\ 5c - d & 4c + 3d \end{bmatrix} = \begin{bmatrix} 4 & -3 \\ 11 & 24 \end{bmatrix}$ , then value of  $a + b - c + 2d$  is:

- (a) 8            (b) 10            (c) 4            (d) 9

6. Given the matrices A and B are of order  $3 \times n$  and  $m \times 5$  respectively, then the order of matrix  $C = 5A + 3B$  is:

- (a)  $3 \times 5$             (b)  $5 \times 3$             (c)  $3 \times 3$             (d)  $5 \times 5$

7. Given that  $\begin{bmatrix} 1 & x \\ -2 & 0 \end{bmatrix} \begin{bmatrix} 4 & 0 \\ 0 & 0 \end{bmatrix} = O$ , then the value of x is:

- (a) -4                      (b) -2                      (c) 2                      (d) 4

8. If  $A = \begin{bmatrix} X & 0 \\ 1 & 1 \end{bmatrix}$  and  $B = \begin{bmatrix} 4 & 0 \\ -1 & 1 \end{bmatrix}$  then the value of x for which  $A^2 = B$  is:

- (a) -2                      (b) 2                      (c) -2 or 2                      (d) 4

9. The matrix  $P = \begin{bmatrix} 0 & 5 & -3 \\ -5 & 0 & -7 \\ 3 & 7 & 0 \end{bmatrix}$  is a

- (a) Diagonal matrix                      (b) Symmetric matrix  
(c) Skew symmetric matrix                      (d) Lower triangular matrix

10. For what value of  $x \in \left[0, \frac{\pi}{2}\right]$ , is  $A + A = -\sqrt{3}I$  where  $A = \begin{bmatrix} \cos x & -\sin x \\ -\sin x & \cos x \end{bmatrix}$  ?

- (i)  $\frac{\pi}{3}$                       (ii)  $\frac{\pi}{6}$                       (iii) 0                      (iv)  $\frac{\pi}{2}$

11. For any square matrix A,  $(A - A')$  is always:

- (a) An identity matrix                      (b) A null matrix  
(c) A symmetric matrix                      (d) A skew symmetric matrix

12. If  $A = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$ , then  $B'A'$  equals:

- (a)  $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$                       (b)  $\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$                       (c)  $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$                       (d)  $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

13. The number of elements below the diagonal of a square matrix of order n is:

- (a)  $\frac{n(n+1)}{2}$                       (b)  $\frac{n(n-1)}{2}$                       (c)  $\frac{(n+1)(n+2)}{2}$                       (d)  $\frac{(n-1)(n-2)}{2}$

14. if  $A = \begin{bmatrix} 2 & -1 & 3 \\ 4 & 5 & 1 \end{bmatrix}$  and  $B = \begin{bmatrix} 2 & 3 \\ 4 & -2 \\ 1 & 5 \end{bmatrix}$ , then:

- (a) only AB is defined                      (b) only BA is defined  
(c) AB and BA both are defined          (d) AB and BA both are not defined

**15.** If  $A = [a_{ij}]$  is a square matrix of order 3 such that  $a_{ij} = i^2 - j^2$  then A is :

- (a) An identity matrix                      (b) A null matrix  
(c) A symmetric matrix                      (d) A skew symmetric matrix

**16.** Assertion **(A)**: If A and B are square matrices of same order, then

$$A^2 - B^2 = (A + B)(A - B) \text{ iff } AB = BA.$$

Reason **(R)**: Matrix multiplication is commutative.

- (a) Both (A) and (R) are true and (R) is the correct explanation for (A).  
(b) Both (A) and (R) are true but (R) is not the correct explanation for (A).  
(c) (A) is true but (R) is false    (d) Both (A) and (R) are false.

**17.** Assertion **(A)**: A matrix A has 32 elements. Its possible dimensions are of 6 different types.

Reason **(R)**: 32 can be expressed as the product of two positive integers in 6 ways.

- (a) Both (A) and (R) are true and (R) is the correct explanation for (A).  
(b) Both (A) and (R) are true but (R) is not the correct explanation for (A).  
(c) (A) is true but (R) is false.  
(d) Both (A) and (R) are false.

**18.** Assertion **(A)**: Every scalar matrix is a diagonal matrix.

Reason **(R)**: In a diagonal matrix, all the diagonal elements are 0.

- (a) Both (A) and (R) are true and (R) is the correct explanation for (A).  
(b) Both (A) and (R) are true but (R) is not the correct explanation for (A).  
(c) (A) is true but (R) is false.  
(d) Both (A) and (R) are false.

**19.** Assertion **(A)**: If A and B are symmetric matrices of same order then  $AB - BA$  is also a symmetric matrix.

Reason **(R)**: Any square matrix A is said to be skew symmetric matrix if  $A = -A^T$ , where  $A^T$  is transpose of matrix A.

- (a) Both (A) and (R) are true and (R) is the correct explanation for (A).
- (b) Both (A) and (R) are true but (R) is not the correct explanation for (A).
- (c) (A) is true but (R) is false.
- (d) Both (A) and (R) are false.

20. If matrix  $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$  and  $A^2 = kA$ , then write the value of  $k$ .

24. Given matrix  $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ , find  $f(A)$ , if  $f(x) = 2x^3 - 3x + 5$ .

27. Let  $A = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$  then show that  $A^2 - 4A + 7I = O$ . Using this result

Calculate  $A^5$ .

28. If the matrix  $A = \begin{bmatrix} 0 & x + y & 1 \\ 3 & z & 2 \\ x - y & -2 & 0 \end{bmatrix}$  is skew symmetric matrix then find the value of  $x$ ,  $y$  and  $z$ .

29. Express the following matrix as the sum of a symmetric matrix and skew symmetric matrix and verify your result:

$$\begin{bmatrix} 3 & -2 & -4 \\ 3 & -2 & -5 \\ -1 & 1 & 2 \end{bmatrix}$$

30. With help of an example show that matrix multiplication is not commutative in general.