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CBSE – XIIth

Maths

Central Board of Secondary Education (CBSE)

Most Probable Questions Topic Wise

SIERRA INNOVATIONS

INDEX

Self Assessment

Case Based Objective Questions :

1. A relation R on a set A is said to be an equivalence relation on A if it is

Reflexive i.e., (a, a) $\in$R $\forall$ a $\in$A.

Symmetric i.e., (a, b) $\in$R $\Rightarrow$ (b, a) $\in$ R$\forall$ a, b $\in$A.

Transitive i.e., (a, b) $\in$ R and (b, c) $\in$ R $\Rightarrow$ (a, c) $\in$R $\forall$ a, b, c $\in$A.

Based on the above information, attempt any 4 out of 5 subparts.

(i) If the relation R = {(1, 1), (1, 2), (1, 3), (2, 2), (2, 3), (3, 1), (3, 2), (3, 3)} is defined on the set A = {1, 2, 3}, then R is

(a) reflexive (b) symmetric

(c) transitive (d) equivalence

(ii) If the relation R = {(1, 2), (2, 1), (1, 3), (3, 1)} is defined on the set A = {1, 2, 3}, then R is

(a) reflexive (b) symmetric

(c) transitive (d) equivalence

(iii) If the relation R on the set N of all natural numbers defined as R = {(x, y) : y = x + 5 and x < 4}, then R is

(a) refilexive (b) symmetric

(c) transitive (d) equivalence

(iv) If the relation R on the set A = {1, 2, 3, ... , 13, 14} defined as R = {(x, y) : 3x – y = 0}, then R is

(a) refilexive (b) symmetric

(c) transitive (d) None of these

(v) If the relation R on the set A = {1, 2, 3} defined as R = {(1, 1), (1, 2), (1, 3), (2, 1), (2, 2), (2, 3), (3, 1), (3, 2), (3, 3)}, then R is

(a) refilexive (b) symmetric

(c) transitive (d) equivalence

Multiple Choice Questions :

2. If f : R $\rightarrow$ R be a function defined f(x) $\frac{x^2-8}{x^2+2}$,

(a) one-one but not onto

(b) one-one and onto

(c) onto but not one-one

(d) neither one-one nor onto

OR

Let A = {2, 3, 4, 5,....., 17, 18}. Let ' ' be the equivalence relation on A $\times$ A, cartesian product of A with itself defined by (a, b) (c, d) iff ad = bc. Then number of ordered pairs of the equivalence class (3, 2) is

(a) 4 (b) 5 (c) 6 (d) 7

3. Let A = {1, 2, 3} and consider the relation R = {(1, 1), (2, 2), (3, 3), (1, 2), (2, 3), (1, 3)}. Then R is

(a) reflexive out not symmetric

(b) reflexive out not transitive

(c) symmetric and transitive

(d) neither symmetric nor transitive

VSA Type Questions :

4. If R = {(x, y) : x + 2y = 8} is a relation on N, then range of R is {a, 2, b}, where a + b = _____.

5. Let A = {x $\in$R : $-4 \le x \le 4$} and $x \neq 0$. If f : A $\rightarrow$ R is defined by f(x) = $\frac{|x|}{x}$, then range of f is_____.

6. Let f : R $\rightarrow$ R be defined by f(x) = $\begin{cases} 2x, x > 3 \\ x^2, 1 < x \le \\ 3x, x \le 1 \end{cases}$ Then,

f(–1) + f(2) + f(4) is_____.

7. State the reason for the relation R in the set {1, 2, 3} given by R = {(1, 2), (2, 1)} not to be transitive.

OR

Let A = {1, 2, 3, 4} and B = {5, 6, 7, 8, 9} and set f = {(1, 5), (2, 6), (3, 7), (4, 8)} be a function from A to B. State whether f is one-one or not.

SAI Type Questions :

8. Let f : R $\rightarrow$ R be defined by (i) f(x) = x + |x| (ii) f(x) = x + 1.

Determine whether f is onto or not.

9. Let A be a finite set. If f : A $\rightarrow$ A is an onto function, then show that f is one-one also.

10. Write the domain of the relation R defined on the set Z of integers as follows :

(a, b) $\in$ R $\Leftrightarrow$ $a^2 + b^2 = 25$

11. Let the function f : R $\rightarrow$ R be defined by f(x) = cosx, $\forall$ x $\in$ R. Show that f is neither one-one nor onto.

OR

Let f : R $\rightarrow$ R be defined by f(x) = x^2 + 1. Find the pre-image of 17 and (–3).

SA II Type Questions :

12. Show that f : $R^+ \to R^+$ defined by f(x) = $\frac{1}{2x}$ is bijective, where R^+ is the set of all non zero positive real number.

OR

Let N be the set of natural numbers and relation R on set N be defined by R = {(x,y) : x,y ∈ N, x + 4y = 10}. Check whether R is reflexive, symmetric and transitive.

13. Let $A = \left\{x : x \in R, -\frac{\pi}{2} \le x \le \frac{\pi}{2}\right\}$ and B = {y : y ≤ R,– 1 ≤ y ≤ 1}. Show that the function f : A → B such that f(x) = sinx is bijective.

14. Show that the function f : R → R defined by $x^3 + x$ is a bijection.

15. Let N be the set of all natural numbers and R be a relation in N defined by R = {(a, b) : a is a factor of b},then show that R is reflexive and transitive out not symmetric.

Case Based Questions :

16. Consider the mapping f : A → B is defined by f(x) = $\frac{x-1}{x-2}$ such that f is a bijection.

Based on given information, answer the following questions.

(i) Find range of f.

(ii) If g : R – {2} → R – {1} is defined by g(x) = 2f(x) –1, then find the range of g(x).

LA Type Questions

17. m is said to be related to n if m and n are integers and m – n is divisible by 13. Does this define an equivalence relation ?

18. Classify the following functions as injective, surjective of bijective.

(i) f : R → R defined by f(x) = sinx

(ii) f : R → R defined by f(x) = $\sin^2 x + \cos^2 x$

19. If A = {1,2,3,4}, define relations on A which have properties of being :

(i) reflexive, transitive but not symmetric.

(ii) symmetric but neither reflexive nor transitive.

(iii) reflexive, symmetric and transitive.

20. Show that the function f : R → R such that

$$f(x) = \begin{cases} 1, \text{if } x \text{ is rational} \\ -1, \text{if } x \text{ is irrational} \end{cases}$$

is many one and not onto.

Find (i) $f\left(\frac{1}{2}\right)$ (ii) $f\left(\sqrt{2}\right)$

(iii) f(π) (iv) f(2 + $\sqrt{3}$)

OR

Show that :

(i) the exponential function f : R → R defined by $f(x) = e^x$ is one-one but not onto.

(ii) the logarithmic function f : R^+ → R defined by $f(x) = \log_a x$, a > 0, a ≠ 1 is a bijective function.

1 Feed Your Brain With Basics

Relations

Domain, Range and Number of Relations :

1. If P={a,b,c} and Q={r}, Then
(A) P x Q ≠ Q x P (B) P x Q = Q x P
(C) n (P×Q) ≠ n(Q x P) (D) 1 and 3

2. Let A= {1,2,3} ,B={3,4} and C={4,5,6}. Then A x (B ∩ C)=.....
(A) {(1,4)} (B) {(2,4)}
(C) {(2,4),(3,4)} (D) {(1,4),(2,4),(3,4)}

3. The relation R defined on the set A={1,2,3,4,5} by R= { (a, b) : $|a^2 - b^2| < 16$; a,b ∈ A} is given by
(A) { (1,1),(2,1),(3, 1),(4,1),(2,3)}
(B) {(2, 2), (3, 2), (4, 2), (2,4)}
(C) {(3, 3), (4, 3), (5, 4), (3, 4)}
(D) {(1,1),(1,2),(1,3),(1,4),(2,1),(2,2), (2,3),(2,4),(3,1),(3.2),(3,3),(3,4),(4,1),(4,2), (4,3), (4,4),(4,5), (5,4),(5,5)}

4. If the relation $R : A \to B$, where $A = \{1, 2, 3\}$ and $B = \{1, 3, 5\}$ is defined by $R = \{(x, y) : x < y, x \in A, y \in B\}$, then
(A) $R = \{(1,3),(1,5),(2,3),(2,5),(3,5)\}$
(B) $R = \{(1,1),(1,5),(2,3),(3,5)\}$
(C) $R^{-1} = \{(3,1),(5,1),(3,2),(5,3)\}$
(D) $R^{-1} = \{(1,1),(5,1),(3,2),(5,3)\}$

5. Let Y = { 1,2,3,4,5}, A = {1,2}, B ={3,4,5} and ϕ denote the null set. If A × B denotes the cartesian product of sets A and B, then (Y × A) ∩ (Y × B) is
(A) Y (B) A (C) B (D) ϕ

6. Given A={1,2,3,4,5,6}. Define a relation R from A to A by R={(x,y)/ $x, y \in A$; y = x + 1 }. Then domain of R is
(A) {1,2,3,4,5} (B) {2,3,4,5,6}
(C) {1,2,3} (D) {4,5,6}

7. If a relation 'R' is defined by $R = \{(x, y) / 2x^2 + 3y^2 \le 6\}$, then the domain of 'R' is
(A) $[-3, 3]$ (B) $\left[-\sqrt{3}, \sqrt{3}\right]$
(C) $\left[-\sqrt{2}, \sqrt{2}\right]$ (D) $[-2, 2]$

8. Let A be a set of first ten natural numbers and R be a relation on A, defined by (x,y) ∈ R ⇔ x + 2y = 10, then domain of R is
(A) {1,2,3,....., 10} (B) {2,4,6,8}
(C) {1,2,3,4} (D) {2,4,6,8,10}

9. Let A={x,y,z} B={1,2}. Then the number of relations from A to B
(A) 2^6 (B) 2^3 (C) 2^2 (D) 2^7

Types of Relations :

10. Let R be a reflexive relation on a finite set A having n elements and let there be m ordered pairs in R, then
(A) $m \ge n$ (B) $m \le n$ (C) $m = n$ (D) $m < n$

11. Let R be a reflexive relation on a set A and I be the identity relation on A. Then
(A) $R \subset I$ (B) $I \subseteq R$
(C) $R = I$ (D) all the above

12. Let A be the set of the children in a family. The relation 'x is a brother of y' The relation on A is
(A) reflexive (B) symmetric
(C) transitive (D) anti symmetric

13. Let $A = \{1, 2, 3\}$ and $R = \{(1,1),(1,3),(3,1),(2,2),(2,1),(3,3)\}$, then the relation R on A is
(A) reflexive (B) symmetric
(C) transitive (D) equivalence

14. Let $A = \{2, 4, 6, 8\}$ and $R = \{(2,4),(4,2),(4,6),(6,4)\}$ then R is
(A) reflexive (B) symmetric
(C) transitive (D) anti symmetric

15. Let A={1,2,3,4}, R={(2,2),(3,3),(4,4),(1,2)} be a relation on A. Then R is
(A) reflexive (B) symmetric
(C) transitive (D) Both 1 & 2

16. N is the set of natural numbers. The relation R is defined on $N \times N$ as follows
$(a,b)R(c,d) \Leftrightarrow a+d=b+c$. Then R is
(A) reflexive only (B) symmetric only
(C) transitive only (D) an equivalence relation

17. Let $R=\{(1,3),(4,2),(2,4),(2,3),(3,1)\}$ be a relation on the set $A=\{1,2,3,4\}$.
Then the relation R is
(A) not symmetric (B) transitive
(C) a function (D) reflexive

18. In the set $A=\{1,2,3,4,5\}$, a relation R is defined by $R=\{(x,y): x,y \in A, x<y\}$.
Then R is
(A) reflexive (B) symmetric
(C) transitive (D) equivalence

19. If $A=\{1,2,3\}$, the number of reflexive relation in A is
(A) 9 (B) 3 (C) 64 (D) 68

20. Let R and S be two non-void relations on set A which of the following statements is false.
(A) R and S are transitive $\Rightarrow R \cup S$ is transitive
(B) R and S are transitive $\Rightarrow R \cap S$ is transitive
(C) R and S are symmetric $\Rightarrow R \cup S$ is symmetric
(D) R and S are symmetric $\Rightarrow R \cap S$ is symmetric

21. Two points A and B in a plane are related if OA=OB, where O is a fixed point.
This relation is
(A) partial order relation
(B) equivalence relation
(C) reflexive but not symmetric
(D) reflexive but not transitive

22. Which one of the following relations on Z is equivalence relation?
(A) $xR_1y \Leftrightarrow |x|=|y|$ (B) $xR_2y \Leftrightarrow x \geq y$
(C) $xR_3y \Leftrightarrow x/y$ (D) $xR_4y \Leftrightarrow x<y$

Inverse Relation :

23. If the relation $R: A \to B$, where $A=\{1,2,3,4\}$ and $B=\{1,3,5\}$ is defined by $R=\{(x,y): x<y, x \in A, y \in B\}$, then RoR^{-1} is
(A) $\{(1,3),(1,5),(2,3),(2,5),(3,5),(4,5)\}$
(B) $\{(3,1),(5,1),(5,2),(5,3),(5,4)\}$
(C) $\{(3,3),(3,5),(5,3),(5,5)\}$
(D) $\{(3,5)\}$

24. R is a relation from {11,12,13} to {8,10,12} defined by y = x-3. Then R^{-1} is
(A) {(8,11),(10,13)} (B) {(11,8),(13,10)}
(C) {(10,11),(8,11)} (D) {(11,8),(10,13),(12,15)}

25. Let A = {1, 2, 3}. The total number of distinct relations that can be defined over A is
(A) 2^9 (B) 6
(C) 8 (D) None of these

26. Given two finite sets A and B such that $n(A)=2$, $n(B)=3$. Then total number of relations from A to B is
(A) 4 (B) 8
(C) 64 (D) None of these

27. The relation R defined on the set of natural numbers as $\{(a, b): a$ differs from b by 3$\}$, is given by
(A) {(1, 4), (2, 5), (3, 6),.....}
(B) {(4, 1), (5, 2), (6, 3),.....}
(C) {(1, 3), (2, 6), (3, 9),..}
(D) None of these

28. The relation R is defined on the set of natural numbers as $\{(a, b): a = 2b\}$. Then R^{-1} is given by
(A) {(2, 1), (4, 2), (6, 3).....}
(B) {(1, 2), (2, 4), (3, 6)....}
(C) R^{-1} is not defined
(D) None of these

29. The relation "less than" in the set of natural numbers is
(A) Only symmetric (B) Only transitive
(C) Only reflexive (D) Equivalence relation

30. Let $P=\{(x,y)|x^2+y^2=1, x,y\in R\}$. Then P is
(A) Reflexive (B) Symmetric
(C) Transitive (D)Anti-symmetric

31. Let R be an equivalence relation on a finite set A having n elements. Then the number of ordered pairs in R is
(A) Less than n
(B) Greater than or equal to n
(C) Less than or equal to n
(D) None of these

32. For real numbers x and y, we write $xRy\Leftrightarrow x-y+\sqrt{2}$ is an irrational number. Then the relation R is
(A) Reflexive (B)Symmetric
(C) Transitive (D)None of these

33. Let X be a family of sets and R be a relation on X defined by 'A is disjoint from B'. Then R is
(A) Reflexive (B)Symmetric
(C) Anti-symmetric (D)Transitive

34. If R is a relation from a set A to a set B and S is a relation from B to a set C, then the relation SoR
(A) Is from A to C (B)Is from C to A
(C) Does not exist (D)None of these

35. If $R\subset A\times B$ and $S\subset B\times C$ be two relations, then $(SoR)^{-1}=$
(A) $S^{-1}oR^{-1}$ (B)$R^{-1}oS^{-1}$
(C) SoR (D)RoS

36. If R be a relation < from $A=\{1,2,3,4\}$ to $B=\{1,3,5\}$ *i.e.*, $(a,b)\in R\Leftrightarrow a<b$, then RoR^{-1} is
(A) $\{(1,3),(1,5),(2,3),(2,5),(3,5),(4,5)\}$
(B) $\{(3,1)(5,1),(3,2),(5,2),(5,3),(5,4)\}$
(C) $\{(3,3),(3,5),(5,3),(5,5)\}$
(D) $\{(3,3)(3,4),(4,5)\}$

37. A relation from P to Q is
(A) A universal set of $P\times Q$
(B) $P\times Q$
(C) An equivalent set of $P\times Q$
(D) A subset of $P\times Q$

38. Let $A=\{a, b, c\}$ and $B=\{1, 2\}$. Consider a relation R defined from set A to set B. Then R is equal to set
(A) A (B)B (C)$A\times B$ (D)$B\times A$

39. Let $n(A)=n$. Then the number of all relations on A is
(A) 2^n (B) $2^{(n)!}$
(C) 2^{n^2} (D)None of these

40. Let R be a reflexive relation on a finite set A having n-elements, and let there be m ordered pairs in R. Then
(A) $m\geq n$ (B)$m\leq n$
(C) $m=n$ (D)None of these

41. The relation R defined on the set $A=\{1, 2, 3, 4, 5\}$ by $R=\{(x, y):|x^2-y^2|<16\}$ is given by
(A) $\{(1, 1), (2, 1), (3, 1), (4, 1), (2, 3)\}$
(B) $\{(2, 2), (3, 2), (4, 2), (2, 4)\}$
(C) $\{(3, 3), (3, 4), (5, 4), (4, 3), (3, 1)\}$
(D) None of these

42. A relation R is defined from $\{2, 3, 4, 5\}$ to $\{3, 6, 7, 10\}$ by $xRy\Leftrightarrow x$ is relatively prime to y. Then domain of R is
(A) $\{2, 3, 5\}$ (B)$\{3, 5\}$
(C) $\{2, 3, 4\}$ (D)$\{2, 3, 4, 5\}$

43. If $R=\{(x,y)|x,y\in Z, x^2+y^2\leq 4\}$ is a relation in Z, then domain of R is
(A) $\{0, 1, 2\}$ (B)$\{0,-1,-2\}$
(C) $\{-2,-1,0,1,2\}$ (D)None of these

44. An integer m is said to be related to another integer n if m is a multiple of n. Then the relation is
(A) Reflexive and symmetric
(B) Reflexive and transitive
(C) Symmetric and transitive
(D) Equivalence relation

Functions

Real valued functions :

1. Let f : {(1,1),(2,3),(0,-1),(-1,-3)} be a function from z to z defined by f(x) = ax+b, for some integers a,b then (a,b) =

(A) (-1,2) (B) (2,-1) (C) (3,-2) (D) (0,3)

2. If $e^{f(x)} = \frac{10+x}{10-x}, x \in (-10,10)$

and $f(x) = k.f\left(\frac{200x}{100+x^2}\right)$ then k =

(A) 0.5 (B) 0.6 (C) 0.7 (D) 0.8

3. $f : R \to R$ is defined as $f(x) = 2x + |x|$ then $f(3x) - f(-x) - 4x =$

(A) $f(x)$ (B) $-f(x)$

(C) $f(-x)$ (D) $2f(x)$

4. $f(1) = 1, n \geq 1 \Rightarrow f(n+1) = 2f(n) + 1$

then $f(n)$ =

(A) 2^{n+1} (B) 2^n (C) $2^n - 1$ (D) $2^{n-1} - 1$

5. If $f(x) = \frac{7^{1+\ln x}}{x^{\ln 7}}$ then f(2015) =

(A) 20 (B) 7 (C) 2015 (D) 100

6. If $f(x) = \frac{\cos^2 x + \sin^4 x}{\sin^2 x + \cos^4 x}$ for $x \in R$ then

$f(2016)$ =

(A) 1 (B) 2 (C) 3 (D) 4

7. If $f = \{(-2,4),(0,6),(2,8)\}$ and

$g = \{(-2,-1),(0,3),(2,5)\}$, then

$\left(\frac{2f}{3g} + \frac{3g}{2f}\right)(0) =$

(A) 1/12 (B) 25/12 (C) 5/12 (D) 13/12

8. If f(x) = sin (log x) then

$f(xy) + f\left(\frac{x}{y}\right) - 2f(x)\cos(\log y) =$

(A) cos (logx) (B) sin (logy)

(C) cos (log (xy)) (D) 0

9. If $f(x+y, x-y) = xy$ then the arithmetic mean of

$f(x,y)$ and $f(y,x)$ is

(A) x (B) y (C) 0 (D) xy

Algebra of Functions:

10. A function f : R → R satisfies the condition,

$x^2 f(x) + f(1-x) = 2x - x^4$. Then f(x) is

(A) $-x^2 - 1$ (B) $-x^2 + 1$

(C) $x^2 - 1$ (D) $-x^4 + 1$

11. Let f(x) = |x – 1|. Then :

(A) $f(x^2) = (f(x))^2$ (B) f(x + y) = f(x) + f(y)

(C) f(|x|) = |f(x)| (D) f(1 + x) is even

Implicit, Explicit Functions:

12. Which of the following is implicit functions –

(A) $y = x^3 + 4x^2 + 5x$ (B) x + y = 1

(C) y = 1 – x (D) y = x + 1

Even and Odd Functions :

13. Let $f(x) = \frac{x}{e^x - 1} + \frac{x}{2} + 1$, then f is

(A) an odd funciton

(B) an even function

(C) both odd and even

(D) neitheer odd nor even

14. Which of the following is an even function

(A) $f(x) = \frac{a^x + a^{-x}}{a^x - a^{-x}}$

(B) $f(x) = \frac{a^x + 1}{a^x - 1}$

(C) $f(x) = x\frac{a^x - 1}{a^x + 1}$

(D) $f(x) = \log_2\left(x + \sqrt{x^2 + 1}\right)$

Periodic Functions :

15. The period of $\cos x^2$ is

(A) 2π (B) $\sqrt{2}\pi$

(C) $4\pi^2$ (D) does not exist

16. Period of $f(x) = e^{\cos\{x\}} + \sin \pi [x]$ is ([ ] and { } denote the greatest integer function and fractional part function respectively)

(A) 1 (B) 2 (C) π (D) 2π

17. Let $f(x)$ be periodic and k be a positive real number such that $f(x+k) + f(x) = 0$ for all $x \in R$.

Then the period of $f(x)$ is

(A) k (B) 2k (C) 4k (D) 8k

18. The period of $f(x) = \sqrt{x - [x]}$ is

(A) no fundamental period

(B) $\frac{1}{2}$

(C) 1

(D) 2

Domain of The Function :

19. The domain of $f(x) = \frac{x^2 + 2x + 1}{x^2 - x - 6}$

(A) R – {3, –2} (B) R – {–3, 2}

(C) R – {3, –2] (D) R – (3, –2)

20. The domain of $f(x) = \frac{1}{\log|x|}$ is

(A) $R - \{0\}$ (B) $R - \{0,1\}$

(C) R - {-1, 0, 1} (D) $(-\infty, \infty)$

21. The domain of $f(x) = \frac{3^x + 3^{-x}}{3^x - 3^{-x}}$ is

(A) $(-\infty, \infty)$ (B) $(-\infty, 0) \cup (0, \infty)$

(C) $(0, \infty)$ (D) $(0,1)$

22. The domain of the function $f(x) = \sqrt{\log_{16} x^2}$ is

(A) x = 0 (B) $|x| \geq 4$

(C) $|x| \geq 1$ (D) $|x| \geq 2$

23. The domain of $f(x) = \frac{1}{\sqrt{|x| - x}}$ is

(A) $(-\infty, 0)$ (B) $(0, \infty)$

(C) $(1, \infty)$ (D) $(-\infty, \infty)$

24. The domain of $f(x) = \frac{1}{[x] - x}$ is

(A) R (B) Z (C) R - Z (D) Q-{0}

25. The domain of $f(x) = \sqrt{x - 2} + \frac{1}{\log(4 - x)}$ is

(A) $[2, \infty)$ (B) $(-\infty, 4)$

(C) $[2,3) \cup (3,4)$ (D) $[3, \infty)$

26. The domain of $f(x) = e^{\sqrt{x}} + \cos x$ is

(A) $(-\infty, \infty)$ (B) $[0, \infty)$

(C) (0,(A) (D) $(1, \infty)$

27. The domain of $\log_a \sin^{-1} x$ is (a>0, $a \neq 1$)

(A) $0 < x \leq 1$ (B) $0 \leq x \leq 1$

(C) $0 \leq x < 1$ (D) $0 < x < 1$

28. The domain of $\cosh^{-1} 5x$ is

(A) R (B) $[0, \infty)$ (C) $\left(\frac{1}{5}, \infty\right)$ (D) $\left[\frac{1}{5}, \infty\right)$

29. For which Domain, the functions

$f(x) = 2x^2 - 1$ and $g(x) = 1 - 3x$ are equal to

(A) R (B) $\left\{\frac{1}{2}, -2\right\}$ (C) $\left(\frac{1}{2}, 2\right)$ (D) $\left[\frac{1}{2}, 2\right]$

Range of The Function :

30. The domain and range of the real function f defined by $f(x)=\frac{4-x}{x-4}$ is given by

(A) Domain = R, Range = {–1, 1}
(B) Domain = R – {1}, Range = R
(C) Domain = R – {4}, Range = {–1}
(D) Domain = R – {–4}, Range = {–1, 1}

31. Range of $f(x)=\frac{1}{1-2\cos x}$ is

(A) $\left[\frac{1}{3},1\right]$ (B) $\left[-1,\frac{1}{3}\right]$
(C) $(-\infty,-1]\cup\left[\frac{1}{3},\infty\right)$ (D) $\left[-\frac{1}{3},1\right]$

32. The range of $f(x)=x^2+x+1$ is

(A) $\left[\frac{3}{4},\infty\right)$ (B) $[0,\infty)$
(C) $[1,\infty)$ (D) $\left[\frac{1}{4},\infty\right)$

33. The domain and range of the function f given b y $f(x)=2-|x-5|$ is

(A) Domain = R^+, Range = $(-\infty,1]$
(B) Domain = R, Range = $(-\infty,2]$
(C) Domain = R, Range = $(-\infty,2)$
(D) Domain = R^+, Range = $(-\infty,2]$

34. $f=\{(x,\frac{x^2}{x^2+1}):x\in R\}$,be a function R into R,range of 'f'

(A) [0,1) (B) $(-\infty,\infty)$
(C) $(0,\infty)$ (D) R^+

35. Range of the function $f(x)=\sqrt{[x]-x}$ is

(A) R (B) $\{1\}$ (C) $\{0\}$ (D) $(0,\infty)$

36. Let $A=\{9,10,11,12,13\}$ and $f:A\to N$ be defined by $f(n)=$ highest prime factor of n, then its range is

(A) $\{13\}$ (B) $\{3,5,11,13\}$
(C) $\{11,13\}$ (D) $\{2,3,5,11\}$

37. The range of f(x) = $\frac{x^2-x+1}{x^2+x+1}$ is

(A) $\left[\frac{1}{3},3\right]$ (B) $\left[\frac{1}{2},2\right]$ (C) $[0,1]$ (D) $[-1,1]$

Types of functions :

38. The equivalent function of $\log x^2$ is

(A) $2\log x$ (B) $2\log|x|$
(C) $|\log x^2|$ (D) $(\log x)^2$

39. The number of linear functions which map $[-1,1]$ to $[0,2]$ are

(A) One (B) Two (C) Four (D) Three

40. If A = (3,81) and $f:A\to B$ is a surjection defined by f(x) = $\log_3 x$ then B =

(A) $[1,4]$ (B) $(1,4]$ (C) $(1,4)$ (D) $[1,\infty)$

41. Let $f(x)=\sin^2\frac{x}{2}+\cos^2\frac{x}{2}$ and $g(x)=\sec^2 x-\tan^2 x$. The two functions are equal over the set

(A) ϕ
(B) R
(C) $R-\left\{x\middle|x=(2n+1)\frac{\pi}{2},n\in Z\right\}$
(D) $R-\{0\}$

42. $f:R\to R$ defined by $f(x)=\dfrac{x}{x^2+1},\ \forall x\in R$ is

(A) one - one
(B) onto
(C) bijective
(D) neither one one nor onto

43. If $f:Z\to Z$ is such that $f(x)=6x-11$ then f is

(A) injective but not surjective
(B) surjective but not injective
(C) bijective
(D) neither injective nor surjective

44. $f:N\to A$ Where A = {0,1} defined by

$f(x)=\begin{cases}0 & if\ x\ is\ odd\\ 1 & if\ x\ is\ even\end{cases}$. Then f is

(A) one - one, onto (B) one-one, into
(C) many-one, onto (D) many-one, into

45. $f:(-\infty,\infty)\to(0,1]$ defined by

$f(x)=\dfrac{1}{x^2+1}$ is

(A) one-one but not onto
(B) onto but not one-one
(C) bijective
(D) neither one-one nor onto

46. The function $f:R\to R$ defined by

$f(x)=4^x+4^{|x|}$ is

(A) One - one and into (B) Many - one and into
(C) One - one and onto (D) Many-one and onto

Functional Equations :

47. If $f(x)=a(x^n+3)$; $f(A)=12$, $f(C)=36$; then $f(B)$ is equal to

(A) 18 (B) 24 (C) 21 (D) 27

48. If $f(x)$ is a polynomial satisfying $f(x).f(1/x)=f(x)+f(1/x)$ and $f(C)=28$, then $f(D)$ is given by -

(A) 63 (B) 65 (C) 67 (D) 68

49. If f(x) = cos (log x), then $\dfrac{f(xy)+f(x/y)}{f(x)f(y)}$ equals-

(A) 0 (B) –1 (C) 1 (D) 2

50. If f is a real function satisfying the relation f(x + y) = f(x) f(y) for all x, y ∈ R and f(A) = 2, then a ∈ N, for which

$\sum_{k=1}^{n} f(a+k)=16(2^n-1)$, is given by -

(A) 2 (B) 4
(C) 3 (D) None of these

51. If $f(x)=\{4-(x-7)^3\}^{1/5}$, then its inverse is-

(A) $7-(4+x^5)^{1/3}$ (B) $7-(4-x^5)^{1/3}$
(C) $7+(4-x^5)^{1/3}$ (D) None of these

52. The inverse of the function $f(x)=\dfrac{e^x-e^{-x}}{e^x+e^{-x}}$ is

(A) $\dfrac{1}{2}\ n\ \dfrac{1+x}{1-x}$ (B) $\dfrac{1}{2}\ n\ \dfrac{2+x}{2-x}$

(C) $\dfrac{1}{2}\ n\ \dfrac{1-x}{1+x}$ (D) $2\ n(1+x)$

Number of Functions :

53. The number of one-one functions that can be defined from A = $\{4,8,12,16\}$ to B is 5040, then n(B)=

(A) 7 (B) 8 (C) 9 (D) 10

54. If A = $\{1,8,11,14,25\}$ then the condition to define a surjection from A to B is

(A) n(A) + n(B) = 20 (B) n(A) <n(B)
(C) n(B) $\le$ 5 (D) n (B) = 10

55. If A = {1, 2, 3}, B = {1, 2} then the number of functions from A to B are

(A) 6 (B) 8 (C) 9 (D) 32

56. The number of non-bijective mappings that can be defined from A = $\{1,2,7\}$ to itself is

(A) 21 (B) 27 (C) 6 (D) 9

57 Let $A=\{1,2,3\}$ and $B=\{a,b,c\}$. If l is number of funcitons from A to B and m is number of one-one functions from A to B, then

(A) l is 9 (B) m is 9

(C) l is 27 (D) m is16

58. The number of constant functions possible from R to B where B = $\{2,4,6,8,....24\}$ are

(A) 24 (B) 12 (C) 8 (D) 6

Composite Functions :

59. The functions $f:R\to R,\ g:R\to R$ are defined as

$$f(x)=\begin{cases}0 & when\ x\ is\ rational\\ 1 & when\ x\ is\ irrational\end{cases}$$

$$g(x)=\begin{cases}-1 & when\ x\ is\ rational\\ 0 & when\ x\ is\ irrational\end{cases}$$

then $(fog)(\pi)+(gof)(e)=$

(A) -1 (B) 0 (C) 1 (D) 2

60. If $f(x)=(a-x^n)^{\frac{1}{n}}$ then $fof(x)$ is

(A) x (B) $a-x$ (C) x^n (D) $x^{\frac{-1}{n}}$

61. If f(x) = $\dfrac{x}{\sqrt{1+x^2}}$ then fofof (x) =

(A) $\dfrac{x}{\sqrt{1+3x^2}}$ (B) $\dfrac{x}{\sqrt{1-x^2}}$

(C) $\dfrac{2x}{\sqrt{1+2x^2}}$ (D) $\dfrac{x}{\sqrt{1+x^2}}$

Inverse of a Function:

62. If f(x) = $\dfrac{e^x+e^{-x}}{2}$ then the inverse of f(x) is

(A) $\log_e\left(x+\sqrt{x^2+1}\right)$ (B) $\log_e\sqrt{x^2+1}$

(C) $\log_e\left(x+\sqrt{x^2-1}\right)$ (D) $\log_e\left(x-\sqrt{x^2-1}\right)$

63. If $f:\{1,2,3,.....\}\to\{0,\pm1,\pm2,....\}$ is defined by

$$f(n)=\begin{cases}n/2 & if\ n\ is\ even\\ -\left(\dfrac{n-1}{2}\right) & if\ n\ is\ odd\end{cases}$$

then $f^{-1}(-100)$ is

(A) 100 (B) 199 (C) 201 (D) 200

64. If $f(x)=Sin^{-1}\{3-(x-6)^4\}^{1/3}$ then $f^{-1}(x)=$

(A) $6+\sqrt[4]{3+\sin^3 x}$ (B) $6+\sqrt[4]{3-\sin^3 x}$

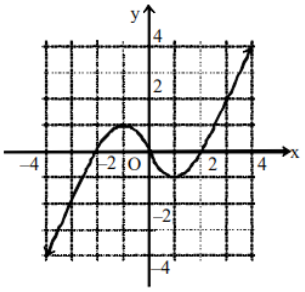
(C) $6+\sqrt[4]{3+\sin x}$ (D) $6+\sqrt[4]{3-\sin x}$

Transformation of Graph:

65. Number of solution of 6 |cosx| = x in [0. 2π] is

(A) 1 (B) 2 (C) 3 (D) 4

66. The graph of the function y = g(x) is shown. The number of solutions of the quation $||g(x)|-1|=\frac{1}{2}$, is

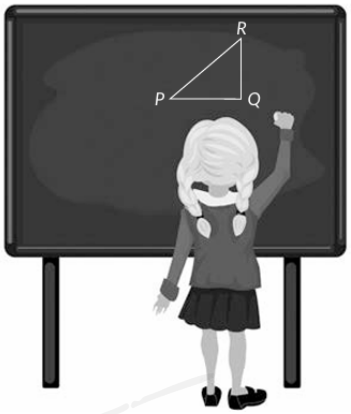


(A) 4 (B) 5 (C) 6 (D) 8

Self Evaluation

Case Based Objective Questions :

1. In the math class, the teacher asked a student to construct a triangle on a black board and name it as PQR. Two angles P and Q were given to be equal to $\tan^{-1}\left(\frac{1}{3}\right)$ and $\tan^{-1}\left(\frac{1}{2}\right)$ respectively. Based on ΔPQR, the teacher give some questions to the students.



Based on above information, attempt any 4 out of 5 subparts.

(i) The value of third angle is _____.

(a) $\tan^{-1}\left(\frac{1}{3}\right)$ (b) $\text{an}^{-1}\left(\frac{1}{2}\right)$

(c) $90° - \tan^{-1}\left(\frac{1}{3}\right)$

(d) $180° - \left(\tan^{-1}\left(\frac{1}{3}\right) + \tan^{-1}\left(\frac{1}{2}\right)\right)$

(ii) The value of cos P + sin P is _____.

(a) $\frac{2}{\sqrt{10}}$ (b) $\frac{3}{\sqrt{10}}$ (c) $\frac{4}{\sqrt{10}}$ (d) $\frac{7}{\sqrt{10}}$

(iii) The value of cos (P + Q + R) = _____.

(a) 1 (b) –1 (c) 0 (d) $\frac{1}{2}$

(iv) If P = $\cos^{-1}$ x, then the value of $10x^2$ = _____.

(a) 7 (b) 6 (c) 8 (d) 9

(v) If Q = $\sin^{-1}$ x and P = $\cos^{-1}$ y, then value of $x^2 + y^2$ = _____.

(a) $\frac{13}{10}$ (b) $\frac{17}{10}$ (c) $\frac{11}{10}$ (d) $\frac{19}{10}$

Multiple Choice Questions :

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

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{6}$ (d) None

3. Find the principal value of $\cot^{-1}(-\sqrt{3})$.

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

4. If $6\sin^{-1}(x^2 - 6x + 8.5) = \pi$, then x is equal to

(a) 1 (b) 2 (c) 3 (d) 8

VSA Type Questions :

5. Find the set of values of $\sec^{-1}\left(\frac{1}{2}\right)$.

OR

What is the domain of the function defined by $f(x) = \sin^{-1}\sqrt{x-1}$?

6. Find the value of $\tan^{-1}\left(\tan\frac{2\pi}{3}\right)$.

OR

Find the domain of the function $\cos^{-1}(2x - 1)$.

7. Find the value of $\cos^{-1}\left(\cos\frac{14\pi}{3}\right)$.

SA I Type Questions :

8. Evaluate : $\cos\left[\cos^{-1}\left(\frac{-\sqrt{3}}{2}\right) + \frac{\pi}{6}\right]$

9. Find the value of $\sec^2(\tan^{-1}2) + \text{cosec}^2(\cot^{-1}3)$.

OR

If $\sin^{-1}(x^2 - 7x + 12) = n\pi$, $\forall$ n ≤ I, then find the value of x.

SA II Type Questions :

10. Find the range of $f(x) = \sin^{-1} x + \tan^{-1} x + \sec^{-1}x$.

11. If cosec^{-1} x + cosec^{-1} y + cosec^{-1} z = $-\frac{3\pi}{2}$, find the value of $\frac{x}{y} + \frac{y}{z} + \frac{z}{x}$.

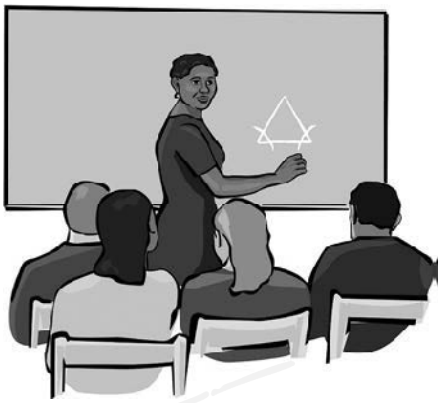
12. Find the value of tan ($\cos^{-1}$ x) and hence evaluate $\tan\left(\cos^{-1}\left(\frac{8}{17}\right)\right)$.

OR

Find the value of $\tan^{-1}\left(\tan\frac{5\pi}{6}\right)+\cos^{-1}\left(\cos\frac{13\pi}{6}\right)$

Case Based Questions :

13. A math teacher explained to the students about topic "Principal Value of Inverse Trigonometric Functions". He told that the value of an inverse trigonometric functions which lies in the range of principal branch is called the principal value of that inverse.



Based on given information, answer the following questions.

(i) Find the principal value of $\sin^{-1}(1)+\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$.

(ii) What will be the principal value of $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$?

LA Type Questions

14. Evaluate: $\frac{1}{\pi}\left\{216\sin^{-}\left(\sin\frac{7\pi}{6}\right)+\right.$

$27\cos^{-1}\left(\cos\frac{2\pi}{3}\right)+28\tan^{-1}\left(\tan\frac{5\pi}{4}\right)+$

$\left.200\cot^{-1}\left(\cot\frac{-\pi}{4}\right)\right\}$

OR

If x, y, z $\in$ [–1, 1] such that $\cos^{-1}$ x + $\cos^{-1}$ y + $\cos^{-1}$ z = 3π, then find the value of xy + yz + zx.

15. Show that $\sin^{-1}\frac{5}{13}+\cos^{-1}\frac{3}{5}=\tan^{-1}\frac{63}{16}$.

OR

Show that $\tan\left(\frac{1}{2}\sin^{-1}\frac{3}{4}\right)=\frac{4-\sqrt{7}}{3}$ and justify why the other value $\frac{4+\sqrt{7}}{3}$ is ignored

1 Feed Your Brain With Basics

1. The domain of $\text{Sin}^{-1}x + \text{Cos}^{-1}x$ is

(A) $(-\pi, \pi)$ (B) $[-1, 1]$

(C) $(0, 2\pi)$ (D) $(-\infty, \infty)$

2. The domain of $\log_e \sin^{-1}(x)$ is

(A) (0, 1] (B) (0, 2]

(C) (0, ∞) (D) (−∞, 0]

3. The range of $\text{Tan}^{-1}x$ is

(A) R (B) $(0, \pi)$

(C) $[0, \pi]$ (D) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

4. The principal value of $\text{Cos}^{-1}\left(\cos\frac{7\pi}{6}\right)$ is

(A) $\frac{7\pi}{6}$ (B) $\frac{5\pi}{3}$ (C) $\frac{5\pi}{6}$ (D) $\frac{13\pi}{6}$

5. $Sin^{-1}(\frac{\sqrt{3}}{2}) - Tan^{-1}(-\sqrt{3})$ is

(A) $\frac{-\pi}{3}$ (B) $\frac{2\pi}{3}$ (C) $\frac{\pi}{6}$ (D) 0

6. $\cot^{-1}\left(2+\sqrt{3}\right) =$

(A) $\frac{\pi}{12}$ (B) $\frac{\pi}{15}$ (C) $\frac{\pi}{5}$ (D) $\frac{3\pi}{10}$

7. $\cot\left[\text{Sin}^{-1}\sqrt{\frac{13}{17}}\right] - \sin\left[\text{Tan}^{-1}\frac{2}{3}\right] =$

(A) $-\frac{2}{\sqrt{13}}$ (B) 0 (C) $\frac{2}{\sqrt{13}}$ (D) $\frac{2}{3\sqrt{13}}$

8. $\sec^2(\cot^{-1}\frac{1}{2}) + \text{cosec}^2(\tan^{-1}1/3) =$

(A) 5 (B) 10 (C) 15 (D) 50

9. Find the value of $\text{Sin}\left(\text{Sin}^{-1}\frac{4}{5} + \text{Sin}^{-1}\frac{7}{25}\right)$

(A) $\frac{119}{125}$ (B) $\frac{117}{125}$ (C) $\frac{118}{125}$ (D) $\frac{113}{125}$

10. $\cos(2\cos^{-1}(7/25)) =$

(A) $\frac{527}{625}$ (B) $-\frac{527}{625}$ (C) $\pi - \frac{527}{625}$ (D) $\frac{24}{25}$

11. If $x + \frac{1}{x} = 2$, the principle value of $\text{Sin}^{-1}x$ is

(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{2}$ (C) π (D) $\frac{3\pi}{2}$

12. The numerical value of $\tan\left(2\,\text{Tan}^{-1}\frac{1}{5} - \frac{\pi}{4}\right)$ is

(A) 1 (B) 0 (C) $\frac{7}{17}$ (D) $-\frac{7}{17}$

13. $2\,\text{Tan}^{-1}(1/2) + \text{Sin}^{-1}(3/5) =$

(A) $\tan^{-1}(\frac{12}{25})$ (B) $\frac{\pi}{4}$

(C) $\frac{\pi}{2}$ (D) $\tan^{-1}(\frac{25}{12})$

14. $\text{Tan}^{-1}(2) + \text{Tan}^{-1}(3) =$

(A) $-\frac{\pi}{4}$ (B) $\frac{\pi}{4}$ (C) $\frac{3\pi}{4}$ (D) $\frac{5\pi}{4}$

15. $Tan^{-1}(\frac{m}{n}) - Tan^{-1}(\frac{m-n}{m+n}) =$

(A) $\frac{\pi}{2}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{4}$ (D) $\frac{3\pi}{4}$

16. $2\,\text{Tan}^{-1}\frac{1}{3}+\text{Tan}^{-1}\frac{1}{7}=$

(A) π (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{4}$ (D) $\frac{3\pi}{4}$

17. $\sec[\text{Tan}^{-1}5+\text{Tan}^{-1}\frac{1}{5}-\text{Tan}^{-1}\frac{3}{4}]=$

(A) $3/5$ (B) $5/3$ (C) $4/5$ (D) $\sqrt{2}$

18. $4\,\text{Tan}^{-1}\frac{1}{5}-\text{Tan}^{-1}\frac{1}{70}+\text{Tan}^{-1}\frac{1}{99}=$

(A) π (B) $\pi/2$ (C) $\pi/4$ (D) $3\pi/4$

19. $Tan^{-1}\left(\frac{5}{12}\right)+Sin^{-1}\left(\frac{24}{25}\right)=Cos^{-1}(x)\Rightarrow x=$

(A) $\frac{-31}{325}$ (B) $\frac{-33}{325}$ (C) $\frac{-36}{325}$ (D) $\frac{-39}{325}$

20. $\text{If Sin}^{-1}(\frac{12}{13})+\text{Sec}^{-1}(\frac{13}{x})=\frac{\pi}{2}$ then x =

(A) 12 (B) 13 (C) 11 (D) 5

21. $\text{If Sin}^{-1}(\frac{3}{x})+\text{Sin}^{-1}(\frac{4}{x})=\frac{\pi}{2}$ then x =

(A) 6 (B) 7 (C) 8 (D) 5

22. $Tan^{-1}(\frac{a}{x})+Tan^{-1}(\frac{b}{x})=\frac{\pi}{2}\ then\ x=$

(A) ab (B) $\sqrt{ab}$

(C) $\sqrt{a^2+b^2}$ (D) a^2+b^2

23. $Tan^{-1}\left(x+\sqrt{1+x^2}\right)=$

(A) $\frac{\pi}{4}-\frac{1}{2}\tan^{-1}x$ (B) $\frac{1}{2}\tan^{-1}x$

(C) $\frac{\pi}{2}-\frac{1}{2}\tan^{-1}x$ (D) $\frac{\pi}{4}+\frac{1}{2}\tan^{-1}x$

24. $\text{If Tan}^{-1}(\frac{3a^2x-x^3}{a^3-3ax^2})=k\,\text{Tan}^{-1}\left(\frac{x}{a}\right)$ then k =

(A) 2 (B) 3 (C) - 2 (D) 4

25. $\text{If Tan}^{-1}(\frac{2x}{x^2-1})+\text{Cos}^{-1}\frac{x^2-1}{x^2+1}=\frac{2\pi}{3}$ then x =

(A) $2-\sqrt{3}$ (B) $\sqrt{3}-\sqrt{2}$

(C) $2+\sqrt{3}$ (D) $+\sqrt{2}$

26. $\text{If Tan}^{-1}(\frac{x-1}{x-2})+\text{Tan}^{-1}(\frac{x+1}{x+2})=\frac{\pi}{4}$ then x=

(A) $\frac{1}{\sqrt{2}}$ (B) $\pm\frac{1}{\sqrt{2}}$ (C) $\pm\frac{1}{\sqrt{3}}$ (D) $\frac{1}{\sqrt{3}}$

27. If $\cos^{-1}x=\cot^{-1}(4/3+\tan^{-1}(1/7)$ then x =

(A) ½ (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{1}{\sqrt{2}}$ (D) $\frac{3}{5}$

28. The trigonometric equation $\text{Sin}^{-1}x=2\text{Sin}^{-1}a$ has a solution for

(A) $|a|\le\frac{1}{\sqrt{2}}$ (B) all real values of a

(C) $|a|<\frac{1}{2}$ (D) $|a|\ge\frac{1}{\sqrt{2}}$

29. If n ∈ N, $\sum_{k=1}^{n}Sin^{-1}(x_k)=\frac{n\pi}{2}$ then $\sum_{k=1}^{n}x_k=$

(A) n (B) k

(C) $\frac{k(k+1)}{2}$ (D) $\frac{n(n+1)}{2}$

30. $\text{If Sin}^{-1}(x-\frac{x^2}{2}+\frac{x^3}{4}-\ldots)+\text{Cos}^{-1}(x^2-\frac{x^4}{2}+\frac{x^6}{4}-\ldots)$

$=\frac{\pi}{2}$ for $0<|x|<\sqrt{2}$ then x =

(A) 1/2 (B) 1 (C) - 1/2 (D) -1

31. The value of $\text{Sin}^{-1}(\sin 10)$ is
(A) 10 (B) $10-3\pi$ (C) $3\pi-10$ (D) -10

32. The greatest of $\text{Tan}^{-1}1, \text{Sin}^{-1}1, \sin 1, \cos 1$ is
(A) $\sin 1$ (B) $\cos 1$
(C) $\tan^{-1}1$ (D) $\sin^{-1}1$

33. If $\text{Tan}^{-1}x, \text{Tan}^{-1}y, \text{Tan}^{-1}z$ are in A.P. then $\frac{2y}{1-y^2}=$
(A) $\frac{x-z}{1+xz}$ (B) $\frac{x+z}{1-xz}$
(C) $x+z$ (D) xz

34. The domain of $Sin^{-1}\frac{2x+1}{3}$ is
(A) (-2, 1] (B) [-2, 1]
(C) R (D) [-1, 1]

35. The domain of $Cos^{-1}\sqrt{2x}$ is
(A) [-1, 1] (B) [-1/2, 1/2]
(C) [0, 1/2] (D) (1, 1/2)

36. The range of $Cot^{-1}x$ is
(A) $(0,\pi)$ (B) $[0,\pi]$
(C) $\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$ (D) R

37. The principal value of $Sin^{-1}\left(Sin\left(\frac{2\pi}{3}\right)\right)$ is
(A) $\frac{2\pi}{3}$ (B) $\frac{\pi}{3}$ (C) $\frac{-\pi}{3}$ (D) $\frac{-2\pi}{3}$

38. The principal value of $Sin^{-1}(Tan(\frac{-5\pi}{4}))$ is
(A) $\frac{\pi}{4}$ (B) $\frac{-\pi}{4}$ (C) $\frac{\pi}{2}$ (D) $\frac{-\pi}{2}$

39. $Sec^{-1}(\frac{2\sqrt{2}}{1+\sqrt{3}})$
(A) $\frac{\pi}{12}$ (B) $\frac{\pi}{3}$ (C) $\frac{3\pi}{4}$ (D) $\frac{\pi}{6}$

40. The value of $Sin(2Tan^{-1}\frac{1}{3})+Cos(Tan^{-1}2\sqrt{2})$ is
(A) $\frac{12}{13}$ (B) $\frac{13}{14}$ (C) $\frac{14}{15}$ (D) $\frac{16}{15}$

41. $\text{Sec}^2(\text{Tan}^{-1}(2)) + \text{Cosec}^2(\text{Cot}^{-1}(2)) =$
(A) 5 (B) 10 (C) 15 (D) 50

42. $Cos^{-1}(\frac{4}{5})+Cos^{-1}(\frac{63}{65})=$
(A) $Cos^{-1}(\frac{204}{325})$ (B) $Cos^{-1}(\frac{300}{325})$
(C) $Cos^{-1}(\frac{201}{300})$ (D) $Sin^{-1}(\frac{204}{325})$

43. $\sin(1/2\ \text{Cot}^{-1}(-3/4)) =$
(A) $1/\sqrt{5}$ (B) $2/\sqrt{5}$
(C) $-2/\sqrt{5}$ (D) $-1/\sqrt{5}$

44. If 'x' is a negative real number then the value of $\text{Cos}^{-1}x + \text{Sec}^{-1}x$ is
(A) rational number (B) irrational number
(C) integer (D) imaginary

45. $\tan(2\ \text{Tan}^{-1}(\frac{\sqrt{5}-1}{2}))=$
(A) 4 (B) 3 (C) $\frac{1}{2}$ (D) 2

46. $\text{Sin}^{-1}\frac{4}{5}+2\,\text{Tan}^{-1}\frac{1}{3}=$
(A) π (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{4}$ (D) $\frac{3\pi}{4}$

47. $Tan^{-1}(\frac{1}{2})+Tan^{-1}(\frac{1}{3})=$
(A) $\frac{\pi}{2}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{6}$

48. $Tan^{-1}(\frac{3}{2})-Tan^{-1}(\frac{1}{5})=$
(A) $\frac{-\pi}{4}$ (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{4}$ (D) $\frac{3\pi}{4}$

49. $4\ \text{Tan}^{-1}\frac{1}{5} - \text{Tan}^{-1}\frac{1}{239} =$
(A) π (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{4}$ (D) $\frac{3\pi}{4}$

50. $Cot(\cos ec^{-1}\frac{5}{3}+Tan^{-1}\frac{2}{3})=$

(A) $\frac{6}{17}$ (B) $\frac{3}{17}$ (C) $\frac{4}{17}$ (D) $\frac{5}{17}$

51. $2Tan^{-1}\frac{1}{5}+Tan^{-1}\frac{1}{7}+2Tan^{-1}\frac{1}{8}=$

(A) π (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{4}$ (D) $\frac{3\pi}{4}$

52. If Sin^{-1} x - Cos^{-1} x = $\frac{\pi}{6}$ then x =

(A) 1/2 (B) $\frac{\sqrt{3}}{2}$ (C) - 1/2 (D) $-\frac{\sqrt{3}}{2}$

53. $Cos^{-1}(\sqrt{3}x)+Cos^{-1}x=\frac{\pi}{2}$ then x =

(A) 0 (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{1}{2}$ (D) 1

54. $Sin^{-1}(\frac{5}{x})+Sin^{-1}(\frac{12}{x})=\frac{\pi}{2}$, (x > 0) then x =

(A) 12 (B) 13 (C) 14 (D) 15

55. $Sin^{-1}(\frac{x}{5})+Co\sec^{-1}(\frac{5}{4})=\frac{\pi}{2}$ then x =

(A) 1 (B) 3 (C) 4 (D) 5

56. $\text{Tan}^{-1}(\frac{1+\sin x}{\cos x})=$

(A) $\frac{\pi}{4}-\frac{x}{2}$ (B) $\frac{\pi}{4}-x$ (C) $\frac{\pi}{4}+x$ (D) $\frac{\pi}{4}+\frac{x}{2}$

57. A value of $\text{Tan}^{-1}\left\{\sin\left(C\text{os}^{-1}\sqrt{\frac{2}{3}}\right)\right\}$ is

(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{6}$

58. $Tan[\frac{1}{2}Sin^{-1}(\frac{2a}{1+a^2})+\frac{1}{2}Cos^{-1}(\frac{1-a^2}{1+a^2})]=$

(A) $\frac{2a}{1+a^2}$ (B) $\frac{2a}{1-a^2}$

(C) $\frac{a}{1+a^2}$ (D) $\frac{a}{1-a^2}$

59. If $3\text{Tan}^{-1}(2-\sqrt{3})-\text{Tan}^{-1}(x)=\text{Tan}^{-1}(1/3)$ then x=

(A) 1/2 (B) 2 (C) 3 (D) 1/3

60. If $Cos^{-1}(\frac{8}{17})-Cos^{-1}(\frac{5}{13})=Cos^{-1}x$ then x =

(A) $\frac{140}{221}$ (B) $\frac{220}{221}$ (C) $\frac{7}{11}$ (D) $\frac{221}{220}$

61. The equation $2\text{Cos}^{-1}x=\text{Cos}^{-1}\left(2x^2-1\right)$ is satisfied by

(A) $-1\le x\le 1$ (B) $0\le x\le 1$

(C) $x\ge 1$ (D) $x\le 1$

62. If $\sum_{r=1}^{n}\text{Cos}^{-1}x_r=0$, then $\sum_{r=1}^{n}x_r$ equals to

(A) 0 (B) n

(C) $\frac{n(n+1)}{2}$ (D) $\frac{n}{2}$

63. $\text{Sin}^{-1}\left[x\sqrt{1-x}-\sqrt{x}\sqrt{1-x^2}\right]=$

(A) $\sin^{-1}x+\sin^{-1}\sqrt{x}$ (B) $\sin^{-1}x-\sin^{-1}\sqrt{x}$

(C) $\sin^{-1}\sqrt{x}-\sin^{-1}x$ (D) 0

64. If $\theta\in\left[\frac{\pi}{2},\frac{3\pi}{2}\right]$ then $\text{Sin}^{-1}\left(\sin\theta\right)=$

(A) θ (B) $\pi-\theta$

(C) $2\pi-\theta$ (D) $-\pi+\theta$

65. $\text{Cos}^{-1}(\frac{\text{a - b}}{\text{a + b}})=$

(A) 2 Tan^{-1} b (B) 2 $\text{Tan}^{-1}\sqrt{\frac{b}{a}}$

(C) 2 $\text{Tan}^{-1}\sqrt{\frac{a}{b}}$ (D) 2 $\text{Tan}^{-1}(\frac{ab}{a-b})$

66. If $\theta=\text{Tan}^{-1}a$, $\phi=\text{Tan}^{-1}b$ and ab=-1, then $\theta-\phi$ is equal to :

(A) 0 (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{2}$ (D) π