INVERSE TRIGONOMETRIC FUNCTIONS

Single Correct Answer Type:

1. The complete set of solutions of the inequality $\left(\cos^{-1}x\right)^2-\left(\sin^{-1}x\right)^2>0$ is

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

2. Let $f(x)=a+2b\cos^{-1}x$, $b>0$. If domain and range of $f(x)$ are the same set, then $b-a$ is equal to

(A) $1-\frac{1}{\pi}$ (B) $\frac{2}{\pi}$ (C) $\frac{2}{\pi}+1$ (D) $1+\frac{1}{\pi}$

3. If $\sin^{-1}x\in\left(0,\frac{\pi}{2}\right)$ then the value of $\mathrm{Tan}\left(\frac{\cos^{-1}\left(\sin\left(\cos^{-1}x\right)\right)+\sin^{-1}\left(\cos\left(\sin^{-1}x\right)\right)}{2}\right)$ is

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

4. Let α,β are the roots of the equation $x^2+7x+k(k-3)=0$, where $k\in(0,3)$ and k is a constant. Then the value of $\mathrm{Tan}^{-1}\alpha+\mathrm{Tan}^{-1}\beta+\mathrm{Tan}^{-1}\frac{1}{\alpha}+\mathrm{Tan}^{-1}\frac{1}{\beta}$ is

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

5. If the equation $x^3+bx^2+cx+1=0\,(b<c)$ has only real root α. Then the value of $2\mathrm{Tan}^{-1}(\mathrm{cosec}\,\alpha)+\mathrm{Tan}^{-1}\left(2\sin\alpha\sec^2\alpha\right)$ is

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

6. Range of the function $f(x)=\cot^{-1}\{-x\}+\sin^{-1}\{x\}+\cos^{-1}\{x\}$, [where $\{.\}$ denotes fractional part function] is

(A) $\left(\frac{3\pi}{4},\pi\right)$ (B) $\left[\frac{3\pi}{4},\pi\right)$ (C) $\left[\frac{3\pi}{2},2\pi\right)$ (D) $\left(\frac{3\pi}{4},\pi\right]$

7. The value of x satisfying the equation

$\left(\sin^{-1}x\right)^3-\left(\cos^{-1}x\right)^3+\left(\sin^{-1}x\right)\left(\cos^{-1}x\right)\left(\sin^{-1}x-\cos^{-1}x\right)=\frac{\pi^3}{16}$ cannot be equal to

(i) $\cos\frac{\pi}{5}$ (ii) $\cos\frac{\pi}{4}$ (iii) $\cos\frac{\pi}{8}$ (iv) $\cos\frac{\pi}{12}$

(A) Only i, iv (B) Only iii (C) Only i, ii, iv (D) Only iv

8. The sum of the series $\cot^{-1}\left(\frac{9}{2}\right)+\cot^{-1}\left(\frac{33}{4}\right)+\cot^{-1}\left(\frac{129}{8}\right)+......\infty$ is equal to

(A) $\cot^{-1}(2)$ (B) $\cot^{-1}(3)$ (C) $\cot^{-1}(-1)$ (D) $\cot^{-1}(1)$

9. Number of integral values of λ such that the equation $\cos^{-1}x+\cot^{-1}x=\lambda$ possesses solution is

(A) 2 (B) 8 (C) 5 (D) 10

10. Let $f(x)=x^{11}+x^9-x^7+x^3+1$ and $f\left(\sin^{-1}(\sin 8)\right)=\alpha$, ($\alpha$ is constant). If $f\left(\mathrm{Tan}^{-1}(\mathrm{Tan}8)\right)=\lambda-\alpha$, then λ is

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

11. The value $4\cos\left[\cos^{-1}\left(\frac{\sqrt{6}-\sqrt{2}}{4}\right)-\cos^{-1}\left(\frac{\sqrt{6}+\sqrt{2}}{4}\right)\right]$ is

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

12. If $\mathrm{Tan}^{-1}\left(\frac{1}{3}\right)+\mathrm{Tan}^{-1}\left(\frac{1}{4}\right)+\mathrm{Tan}^{-1}\left(\frac{1}{5}\right)+\mathrm{Tan}^{-1}\left(\frac{1}{n}\right)=\frac{\pi}{4}$, $n\in N$, then $n=$

(A) 36 (B) 42 (C) 47 (D) 30

13. Let $m=\sin^{-1}\left(a^6+1\right)+\cos^{-1}\left(a^4+1\right)-\mathrm{Tan}^{-1}\left(a^2+1\right)$, then the image of the line $x+y=m$ about the y-axis is

(A) $4x-3y+\pi=0$ (B) $x-y+\frac{\pi}{4}=0$ (C) $x-y+\frac{\pi}{2}=0$ (D) $3x-4y+\pi=0$

14. Let $3\sin^{-1}\left(\log_2^x\right)+\cos^{-1}\left(\log_2^y\right)=\frac{\pi}{2}$ and $\sin^{-1}\left(\log_2^x\right)+2\cos^{-1}\left(\log_2^x\right)=\frac{11\pi}{6}$ then the value of $\frac{1}{x^2}+\frac{1}{y^2}+2$ is

(A) 6 (B) 10 (C) 4 (D) 8

15. If $x=\cot^{-1}\left(\sqrt{\cos 2\theta}\right)-\mathrm{Tan}^{-1}\left(\sqrt{\cos 2\theta}\right)$, then $\sin x=$

(A) $\cos^2\theta$ (B) $\sin^2\theta$ (C) $\mathrm{Tan}^2\theta$ (D) $\mathrm{cosec}^2\theta$

16. If $\sum_{i=1}^{2n}\sin^{-1}(x_i)=n\pi$, then $\sum_{i=1}^{2n}x_i$ is

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

17. The value of a for which $ax^2+\sin^{-1}\left(x^2-2x+2\right)+\cos^{-1}\left(x^2-2x+2\right)=0$ has a real solution, is

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

18. In ΔABC with $\underline{|c}=90^\circ$, the value of $\mathrm{Tan}^{-1}\left(\frac{a}{b+c}\right)+\mathrm{Tan}^{-1}\left(\frac{b}{a+c}\right)$ is

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

19. If $\cos^{-1}x+\cos^{-1}y+\cos^{-1}z=3\pi$, then the value of $\frac{x^{2019}+y^{2019}+z^{2019}+6}{x^{2020}+y^{2020}+z^{2020}}$ is

(A) 0 (B) –3 (C) 1 (D) 2

20. Let $\cos^{-1}x+\cos^{-1}(2x)+\cos^{-1}(3x)=\pi$. If 'x' satisfies the equation $ax^3+bx^2+cx+d=0$, then $(b+c)-(a+d)=$

(A) 11 (B) 12 (C) 9 (D) 3

Numerical Based:

21. Number of values of ‘x’ satisfying the equation $\sin^{-1}x - \cos^{-1}x = \sin^{-1}(3x-2)$ is _______

22. If $a\sin^{-1}x - b\cos^{-1}x = c$, such that the value of $a\sin^{-1}x + b\cos^{-1}x$ is $\dfrac{m\pi ab + c(a-b)}{a+b}$, $m \in N$. Then the value of $m^2 + m + 2$ is _______

23. If the sum $\sum_{b=1}^{10}\sum_{a=1}^{10}\text{Tan}^{-1}\left(\dfrac{a}{b}\right) = m\pi$, then the value of $m+4$ is _______

24. If $\sin^{-1}\left(x - \dfrac{x^2}{2} + \dfrac{x^3}{4}......\right) + \cos^{-1}\left(x^2 - \dfrac{x^4}{2} + \dfrac{x^6}{4}......\right) = \dfrac{\pi}{2}$ for $0 < |x| < \sqrt{2}$, then x is _______

25. Let $f(x) = \sin^{-1}\left(\dfrac{2x}{1+x^2}\right) + 2\text{Tan}^{-1}x,\ x > 1$ then the value of $f(2020)$ is _______ π.

KEY

1.	B	2.	D	3.	A	4.	C	5.	B
6.	D	7.	C	8.	A	9.	C	10.	A
11.	B	12.	C	13.	B	14.	D	15.	C
16.	B	17.	B	18.	A	19.	C	20.	D
21.	2	22.	4	23.	29	24.	1	25.	3.14