TRIGNOMETRIC FUNCTION & INVERSE CIRCULAR FUCTIONS

CLASS – XII

1. Numbers of values of between $-\pi$ and $3\pi/2$ that satisfies the equation $5\cos 2\theta + 2\cos^2\theta/2 + 1 = 0$
   a) 3 b) 4 c) 5 d) 6
2. Number of values of x between 0 and 2π that satisfies the equation $\sin x + \sin 2x + \sin 3x = \cos x + \cos 2x + \cos 3x$ is
   a) 3 b)4 c) 5 d) 6
3. General solution of $\tan x + \tan 2x + \tan 3x = \tan x \tan 2x \tan 3x$ is
   a) $\frac{n\pi}{6}$ b) $\frac{n\pi}{3}$ c) $n\pi$ d) $3n\pi$
4. Number of solutions of $\sin^3 x + \sin x \cos x + \cos^3 x = 1$ in $[0, 2\pi]$ is
   a) 2 b) 3 c) 4 d) more than 4
5. Number of solutions of $\frac{\tan 3x - \tan 2x}{1+\tan 3x \tan 2x} = 1$ in $[-2\pi, 2\pi]$ is
   a) 2 b) 4 c) 8 d) None of these
6. If $\tan a\theta - \tan b\theta = 0$, then the values of θ form a series in
   a) A.P. b) G.P. c) HP d) None of these
7. If $\cos p\theta + \cos q\theta = 0$, then the different values of θ are in A.P. whose common difference is
   a) $\frac{\pi}{p+q}$ b) $\frac{\pi}{p-q}$ c) $\frac{2\pi}{p\pm q}$ d) $\frac{3\pi}{p\pm q}$
8. The value of k for which the equation $\sin x + \cos(k + x) + \cos(k - x) = 2$ has real solutions is
   a) $n\pi - \frac{\pi}{3} \le k \le n\pi + \frac{\pi}{3}$ c) $2n\pi - \frac{\pi}{6} \le k \le 2n\pi + \frac{\pi}{6}$
   b) $2n\pi - \frac{\pi}{3} \le k \le 2n\pi + \frac{\pi}{6}$ d) $n\pi - \frac{\pi}{6} \le k \le n\pi + \frac{\pi}{6}$
9. Number of solutions of the equation $(2 + \sqrt{3})\cos x = 1 - \sin x$ in the interval $[-\pi, \pi]$ is
   a) 2 b) 3 c) 4 d) None of these
10. Number of solutions of the equation $\operatorname{cosec}\theta - \cot\theta = 1$ in $[0, 2\pi]$ is
    a) 4 b) 3 c) 2 d) 1
11. Number of solution of the equation $\tan\theta + \sec\theta = \sqrt{3}$ between 0 and 4π is
    a) 4 b) 3 c) 2 d) 1
12. Number of solution of $3\sec\theta - 5 = 4\tan\theta$ in $[0, 4\pi]$ is
    a) 2 b) 4 c) 6 d) 8
13. Number of solutions of the equation $\tan x + \sec x = 2\cos x$ lying in the interval $[0, 2\pi]$ is
    a) 0 b) 1 c) 2 d) 3
14. $2\cos^2 x - 5\operatorname{cosec} x$ is equal to 1 for exactly 7 distinct values of $x \in [0, n\pi]$, then the greatest value n is
    a) 5 b) 7 c) 9 d) 13
15. The number of all possible triplets (a_1, a_2, a_3) such that $a_1 + a_2\cos 2x + a_3 \sin^2 x = 0$ for all x is
    a) 0 b) 1 c) 3 d) infinite
16. If $\tan\left(\frac{\pi}{2}\sin\theta\right) = \cot\left(\frac{\pi}{2}\cos\theta\right)$ then $\sin\theta + \cos\theta$ equals
    a) 2n – 1 b) 2n + 1 c) 2n d) none of these
17. If $\sin\left(\frac{\pi}{4}\cot\theta\right) = \cos\left(\frac{\pi}{4}\tan\theta\right)$ then θ equals
    a) $n\pi + \frac{\pi}{4}$ b) $2n\pi \pm \frac{\pi}{4}$ c) $n\pi - \frac{\pi}{4}$ d) $2n\pi \pm \frac{\pi}{6}$
18. The number of values of x in the interval $[0, 5\pi]$ satisfying the equation $3\sin^2 x - 7\sin x + 2 = 0$ is
    a) 0 b) 5 c) 6 d) 10
19. The sum of all the real roots of the equation $\cos^7 x + \sin^4 x = 1$ in the open interval $[-\pi, \pi]$ is
    a) 0 b) $\frac{\pi}{2}$ c) π d) None of these

20. The equation (cos p – 1) x^2 + (cos p) x + sin p =0, where x is a variable has real roots. Then the interval of p may be any one of the following:
a) (0, 2π) b) (−π, 0) c) $(-\frac{\pi}{2}, \frac{\pi}{2})$ d) (0, π)

21. The equation cos 2x + a sin x = 2a – 7 possesses a solution if
a) a < 2 b) 2 ≤a ≤6 c) a> 6 d) a < 1

22. The equation 4 $\sin^2$x + 4 sin x + a^2 – 3 = 0 possesses a solution if a lies in the interval
a) (0, −2) b) (2, ∞) c) [−2, 2] d) (−∞, −2)

23. If sin x + cos x = $\sqrt{a+\frac{1}{a}}$ a > 0 and x ∈[0, π] then number of pairs of (a, x) is
a) 0 b) 1 c) 2 d) infinite

24. The number of points inside the curve $x^2 + y^2 \leq 4$ satisfying $\tan^4 x + \cot^4 x + 1 = 3\sin^2 y$ is
a) 1 b) 2 c) 4 d) infinite

25. The smallest positive root of the equation tan x – x = 0 lies in the interval
a) $\left(0, \frac{\pi}{2}\right)$ b) $(\frac{\pi}{2}, \pi)$ c) $(\pi, \frac{3\pi}{2})$ d) $\left(\frac{3\pi}{2}, 2\pi\right)$

26. The number of values of θ in the interval $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ satisfying the equation
(1 – tan θ)(1 + tan θ)$\sec^2\theta + 2^{\tan^2\theta} = 0$ is
a) 2 b) 1 c) 3 d) 4

27. The number of pairs (x, y) satisfying the equation sin x + sin y = sin (x + y) and $|x| + |y| = 1$ is
a) 2 b) 4 c) 6 d) infinite

28. If 0≤x ≤2π, then the number of real values of x satisfying $81^{\sin^2 x} + 81^{\cos^2 x} = 30$ is
a) 2 b) 4 c) 8 d) infinite

29. The number of solutions of $|\cot x| = \cot x + \operatorname{cosec} x$ is [0,2π] is
a) 0 b) 1 c) 2 d) 3

30. The number of solutions of $2\sqrt{2}\sin x\,|\cos x| = 1$ is [0 , 2π] is
a) 4 b) 3 c) 2 d) 0

31. The number of solutions of the equation 1 + sin x $\sin^2\frac{2x}{2}$ = 0 is $|-\pi, \pi|$ is
a) 0 b) 1 c) 2 d) 0

32. The general value of θ satisfying both the equation cos θ = $\frac{-1}{\sqrt{2}}$ and tan θ = 1 is
a) nπ + $\frac{\pi}{4}$ b) nπ + $\frac{5\pi}{4}$ c) 2nπ + $\frac{\pi}{4}$ d) 2nπ + $\frac{5\pi}{4}$

33. The number of solutions of sin x + sin 2x + sin x + sin 4x = 4 in the interval [0, 10π] is
a) 0 b) 8 c) 16 d) 1

34. The number of solutions of cos x + cos 2x + cos 3x +| cos 4x + cos 5x =5 in the interval [0, 2π] is
a) 0 b) 10 c) 20 d) 1

35. The number of solutions of sin x + cos 4x = 2 in the interval (0, 4π) is
a) 0 b) 4 c) 8 d) 1

36. If f(x) = max {tan x, cot x}. Then number of roots of the equation f(x) = $\frac{1}{2+\sqrt{3}}$ in (0, 2π) is
a) 0 b) 2 c) 4 d) infinite

37. The set of all x in the interval [0, π] for which 2 $\sin^2$x – 3 sin x + 1 ≥0 is
a) Φ c) $\left[0, \frac{\pi}{6}\right] \cup \left\{\frac{\pi}{2}\right\}$
b) $\left\{\frac{\pi}{2}\right\}$ d) $\left[0, \frac{\pi}{6}\right] \cup \left\{\frac{\pi}{2}\right\} \cup \left[\frac{5\pi}{6}, \pi\right]$

38. The set of all x in the interval (−π, π) satisfying $|4\sin x - 1| < \sqrt{5}$ is given by
a) $\left(\frac{-\pi}{10}, \frac{3\pi}{10}\right)$ b) $\left(\frac{\pi}{10}, \frac{3\pi}{10}\right)$ c) $\left(\frac{-3\pi}{10}, \frac{\pi}{10}\right)$ d) $\left(\frac{-3\pi}{10}, \frac{-\pi}{10}\right)$

39. The maximum value of $\cot\alpha_1 \cot\alpha_2 \ldots\ldots\ldots\ldots \cot\alpha_n$, under the restriction $0 \leq \alpha_1, \alpha_2 \ldots\ldots \leq \pi/2$ and $\cot\alpha_1 \cot\alpha_2 \ldots\ldots\ldots\ldots \cot\alpha_n = 1$ is
a) $\frac{1}{2^{n/2}}$ b) $\frac{1}{2^n}$ c) $\frac{1}{2n}$ d) 1

40. If $\sin^{-1}\left(x-\frac{x^2}{2}+\frac{x^3}{4}-\cdots\right)+\cos^{-1}\left(x^2-\frac{x^4}{2}+\frac{x^6}{4}\ldots.\right)=\frac{\pi}{2}$ or $0<|x|<\sqrt{2}$ then x equals

a) 1/2 b) 1 c) – 1/ 2 d) – 1

41. The value of $\sin^{-1}\sin(\frac{2\pi}{3})$ is

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

42. $\tan\{ 2\tan^{-1}1/5 - \pi/4\}$ equals

a) $-7/17$ b) 7/17 c) 7/ 12 d) – 7/12

43. The value of $\tan\left(cos^{-1}\frac{4}{5}+tan^{-1}\frac{2}{3}\right)$ is

a) 6/ 17 b) 7 /16 c) 16/7 d) None of these

44. For the principle value $\sin^{-1}(\sin 5)+\cos^{-1}(\cos 6)+\tan^{-1}(\tan 7)$ is equal to

a) 18 b) $6-2\pi$ c) $18-6\pi$ d) $2\pi - 6$

45. If $2\tan^{-1}x+\cos^{-1}\frac{1-x^2}{1+x^2}$ is independent of x, then x lies in the interval

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

46. The set of values of x for which the formula $2\sin^{-1}x=\sin^{-1}(2x\sqrt{1-x^2})$ is true for

a) $(-1, 0)$ b) $[0, 1]$ c) $\left[\frac{-\sqrt{3}}{2},\frac{\sqrt{3}}{2}\right]$ d) $\left[\frac{-1}{\sqrt{2}},\frac{1}{\sqrt{2}}\right]$

47. $\sin^{-1}\left(\sin\frac{7\pi}{6}\right)+\cos^{-1}\left(\cos\frac{2\pi}{3}\right)+\tan^{-1}\left(\tan\frac{5\pi}{4}\right)+\cot^{-1}\left(\cot\frac{-\pi}{4}\right)+\sec^{-1}\left(\sec\frac{-\pi}{4}\right)+\text{cosec}^{-1}\left(\text{cosec}\frac{\pi}{3}\right)$ equals

a) $\frac{35\pi}{12}$ b) $\frac{25\pi}{12}$ c) $\frac{41\pi}{12}$ d) None of these

48. If $\sum_{i=1}^{10} cos^{-1}x_i = 0$ then $\sum_{i=1}^{10} x_i$ is equal to

a) 0 b) 1 c) 10 d) 5π

49. If $[\sin^{-1}\cos^{-1}\sin^{-1}\tan^{-1}x] = 1$, then x belongs to the interval, where [ ] denotes the greatest integer f, unction

a) [tan sin cos 1, tan sin cos sin 1] c) $[-1, 1]$

b) [tan sin cos 1, tan sin cos sin 1] d) [sin cos tan 1, sin cos sin tan 1]

50. If $\sum_{i=1}^{2n} sin^{-1}x_i = n\pi$ ($n \in I^+$) then $\sum_{i=1}^{n} x_i^3$ equals

a) n^3 b) $8n^3$ c) 2n d) n

51. The greatest an least value of $(\sin^{-1}x)^3+(\cos^{-1}x)^3$ are respectively

a) $-\frac{\pi}{2},\frac{\pi}{2}$ b) $-\frac{\pi^3}{8},\frac{\pi^3}{8}$ c) $\frac{\pi^3}{32},\frac{7\pi^3}{8}$ d) None of these

52. The greatest value of tan 1, $\tan^{-1}1$, sin 1, $\sin^{-1}1$, cos 1 is

a) Tan 1 b) $\tan^{-1}1$ c) sin 1 d) None of these

53. If $\sin^{-1}x+\sin^{-1}y+\sin^{-1}z=\frac{3\pi}{2}$, then the value of $x+y^2+z^3-\frac{3}{x+y^2+z^3}$ is

a) 0 b) 1 c) 2 d) 3

54. If $f(x)=\sin^{-1}x+\cos^{-1}x+\tan^{-1}x+\cot^{-1}x+\sec^{-1}x$, then f(x) lies in the interval

a) $[\pi, 2\pi]$ b) $(\pi, 2\pi)$ c) $[\pi, \frac{3\pi}{2}) \cup (\frac{3\pi}{2}, 2\pi]$ d) None of these

55. The value of $\tan^{-1}1+\tan^{-1}2+\tan^{-1}3$ is

a) Π b) 2π c) 0 d) None of these

56. Solution set of the equation $(\cos^{-1}x)^2-(\sin^{-1}x)^2>0$ is

a) $[0, \frac{1}{\sqrt{2}})$ b) $[-1, \frac{1}{\sqrt{2}})$ c) $(-1, \sqrt{2})$ d) None of these

57. $\sin^{-1}(\sin 5) > x^2 - 4x$ holds if

a) $x < 2-\sqrt{9-2\pi}$ c) $x > 2+\sqrt{9-2\pi}$

b) $x = 2+\sqrt{9-2\pi}$ d) $x \in (2-\sqrt{9-2\pi}, 2+\sqrt{9-2\pi})$

58. If $A = 2\tan^{-1}(2\sqrt{2}-1)$, $B = 3\sin^{-1}1/3+\sin^{-1}3/5$ then

a) A > B b) A < B c) A = B d) 2A = 3B

59. If $(\cot^{-1}x)^2 - 3(\cot^{-1}x) + 2 > 0$ then x lies in
a) (cot 2 , cot 1) c) (cot 1, ∞)
b) $(-\infty, \cot 2) \cup (\cot 1, \infty)$ d) $(-\infty, \cot 1) \cup (\cot 2, \infty)$

60. If $(\tan^{-1}x)^2 + (\cot^{-1}x)^2 = \frac{5\pi^2}{8}$ then x equals
a) – 1 b) 1 c) 0 d) √3

61. Solution of the equation $3\sin^{-1}\left(\frac{2x}{1+x^2}\right) - 4\cos^{-1}\frac{1-x^2}{1+x^2} + 2\tan^{-1}\left(\frac{2x}{1-x^2}\right) = \frac{\pi}{3}$ is
a) √3 b) 1/√3 c) 1 d) 0

62. The solution of $\tan^{-1}2x + \tan^{-1}3x = \frac{\pi}{4}$ is
a) 1/6 b) – 1 c) {1/6, - 1 } d) 1/2

63. If $\sin\left(\frac{\cos^{-1}x}{5}\right) = 1$ then x equals
a) 0 b) $\frac{\pi}{2}$ c) $\frac{5\pi}{2}$ d) None of these

64. If $\tan^{-1}\frac{1}{a-1} = \tan^{-1}\frac{1}{x} + \tan^{-1}\frac{1}{a^2-x+1}$ then x equals
a) a, $a^2 - a + 1$ b) 1/a, $a^2 - a + 1$ c) 1/a, $a^2 + a + 1$ d) None of these

65. Number of solutions of $\cos^{-1}(1 - x) - 2\cos^{-1}x = \frac{\pi}{2}$ is
a) 0 b) 1 c) 2 d) None of these

66. If $\tan^{-1}x + \cos^{-1}\frac{y}{\sqrt{1+y^2}} = sin^{-1}\frac{3}{10}$ where x and y are positive integers, then the number of positive pair of (x, y) is
a) 1 b) 2 c) 3 d) 4

67. $\cos\tan^{-1}\sin\cot^{-1}x$ is equal to
a) x b) 1 c) $\frac{x^2+1}{x^2+2}$ d) $\sqrt{\frac{x^2+1}{x^2+2}}$

68. If $2\tan^{-1}x = \sin^{-1}\frac{2a}{1+a^2} + \cos^{-1}\frac{1-b^2}{1+b^2}$, then x equal to
a) $\frac{a+b}{1+ab}$ b) $\frac{a+b}{1-ab}$ c) $\frac{a-b}{1+ab}$ d) $\frac{a^2-b^2}{1-a^2b^2}$

69. $\tan^{-1}1/2 + \tan^{-1}1/8 + \tan^{-1}1/18 + \ldots\ldots$ up to ∞ is
a) π/4 b) π/2 c) π d) infinity

70. $\cot^{-1}3 + \cot^{-1}7 + \cot^{-1}13 + \ldots\ldots + \cot^{-1}(1 + n + n^2) \ldots$ to ∞ is equal to
a) 2π/3 b) 0 c) π/2 d) π/4

In the following (71 to 74) one or more than one alternatives may be correct:

71. If $4\cos\theta - 3\sec\theta = 2\tan\theta$, then θ=
a) $n\pi + (-1)^n \pi/10$ b) $n\pi + (-1)^n \pi/6$ c) $n\pi + (-1)^n 3\pi/10$ d) nπ

72. $2\sin^2x + \sin^2 2x = 2$, $-\pi < x < \pi$, then x =
a) ±π/2 b) ±π/4 c) ±3π/4 d) None of these

73. If $\sqrt{3}\sin\theta - \cos\theta = \sqrt{2}$, then θ =
a) $2n\pi - \frac{\pi}{3} \pm \frac{3\pi}{4}$ b) $n\pi + (-1)^n\frac{\pi}{4} + \frac{\pi}{6}$ c) $2n\pi + \frac{\pi}{3} + \frac{3\pi}{4}$ d) $n\pi + (-1)^n\frac{\pi}{4} - \frac{\pi}{6}$

74. If $x = X\cos\theta - Y\sin\theta$, $y = X\sin\theta + Y\cos\theta$ and $x^2 + 4xy + y^2 = AX^2 + BY^2$, $0 \le \theta \le \frac{\pi}{2}$
a) θ = π/6 b) θ = π/4 c) A = 3 d) B = 1