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MATHS

BOOKS - OBJECTIVE RD SHARMA MATHS VOL I (HINGLISH)

TRIGONOMETRIC EQUATIONS AND INEQUATIONS

Section I Solved Mcqs

1. The general solution of the equation

$\sin 2x + 2\sin x + 2\cos x + 1 = 0$is

A. $3n\pi - \frac{\pi}{4}, n \in Z$

B. $2n\pi + \frac{\pi}{4}, n \in Z$

C. $2n\pi + (-1)^n \sin^{-1}\left(\frac{1}{\sqrt{3}}\right), n \in Z$

D. $n\pi - \frac{\pi}{4}, n \in Z$

Answer: D

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2. The possible values of $\theta \in (0, \pi)$ such that $\sin(\theta) + \sin(4\theta) + \sin(7\theta) = 0$ are (1) $\frac{2\pi}{9}, \frac{i}{4}, \frac{4\pi}{9}, \frac{\pi}{2}, \frac{3\pi}{4}, \frac{8\pi}{9}$ (2) $\frac{\pi}{4}, \frac{5\pi}{12}, \frac{\pi}{2}, \frac{2\pi}{3}, \frac{3\pi}{4}, \frac{8\pi}{9}$ (3) $\frac{2\pi}{9}, \frac{\pi}{4}, \frac{\pi}{2}, \frac{2\pi}{3}, \frac{3\pi}{4}, \frac{35\pi}{36}$ (4) $\frac{2\pi}{9}, \frac{\pi}{4}, \frac{\pi}{2}, \frac{2\pi}{3}, \frac{3\pi}{4}, \frac{8\pi}{9}$

A. $\frac{2\pi}{9}, \frac{\pi}{4}, \frac{\pi}{2}, \frac{2\pi}{3}, \frac{3\pi}{4}, \frac{35\pi}{6}$

B. $\frac{2\pi}{9}, \frac{\pi}{4}, \frac{\pi}{2}, \frac{2\pi}{3}, \frac{3\pi}{4}, \frac{8\pi}{9}$

C. $\frac{2\pi}{9}, \frac{\pi}{4}, \frac{4\pi}{9}, \frac{\pi}{2}, \frac{3\pi}{4}, \frac{8\pi}{9}$

D. $\frac{\pi}{4}, \frac{5\pi}{2}, \frac{\pi}{2}, \frac{2\pi}{3}, \frac{3\pi}{4}, \frac{8\pi}{9}$

Answer: C

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3. For $x \in (0, \pi)$, the equation

$\sin x + 2\sin 2x - \sin 3x = 3$ has

A. infinitely many solutions

B. three solutions

C. one solution

D. no solution

Answer: D

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4. If $0 \leq x \leq 2\pi$, then the number of real values of x, which satisfy the equation $\cos x + \cos 2x + \cos 3x + \cos 4x = 0$, is

A. 3

B. 5

C. 7

D. 9

Answer: C

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5. The number of distinct real roots of $\begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0$ in the interval $-\frac{\pi}{4} \leq x \leq t\frac{\pi}{4}$ is

A. 4

B. 1

C. 2

D. 3

Answer: C

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6. The equation $2\left(\cos^8\theta - \sin^8\theta\right)\sec 2\theta = a^2$ has real solution if a lies in the interval

A. $\left[-\sqrt{2}, \sqrt{2}\right]$

B. $\left[-\sqrt{2}, -1\right) \cup \left(1, \sqrt{2}\right]$

C. $\left[-\sqrt{2}, -1\right] \cup \left[1, \sqrt{2}\right]$

D. none of these

Answer: B

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7. If the equation $k\cos x - 3\sin x = k + 1$ has a solution for x then

A. $[4, \infty)$

B. $[-4, 4]$

C. $(-\infty, 4]$

D. none of these

Answer: C

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8. The equation $a\cos x - \cos 2x = 2a - 7$ passesses a solution if

A. $a > 6$

B. 2 le a le 6`

C. $a > 2$

D. $a = -4$

Answer: B

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9. If $\cos x + \sqrt{\sin x} = 0,$ then $x =$

A. $\sin^{-1}\left(\frac{\sqrt{5}-1}{2}\right)$

B. $\pi - \sin^{-1}\left(\frac{\sqrt{5}-1}{2}\right)$

C. $\sin^{-1}\left(\frac{1-\sqrt{5}}{2}\right)$

D. $\cos^{-1}\left(\sqrt{\frac{\sqrt{5}-1}{2}}\right)$

Answer: A

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10. Find the smallest positive number p for which the equation $\cos(p\sin x) = \sin(p\cos x)$ has a solution $x \in [0, 2\pi]$.

A. 2

B. 1

C. 3

D. none of these

Answer: A

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11. the number of solution of the equation $1+\sin x.\sin^2\left(\frac{x}{2}\right)=0$, in $[-\pi,\pi]$, is

A. 0

B. 1

C. 3

D. none of these

Answer: A

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12. The number of solution of the equation $2\sin^3 x+2\cos^3 x-3\sin 2x+2=0 \text{in}[0,4\pi]$, is

A. 2

B. 3

C. 4

D. 5

Answer: C

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13. The number of solution (s) of the equation

$\sin x + \cos x = \min\{\sqrt{3}, a^2 - 4a + 5\}, a \in R$, is

A. 1, if $a < 2$

B. 2, if $a > 2$

C. 0, if $a = 2$

D. infinitely many for any $a \in R$.

Answer: D

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14. If $\sin^2\theta - 2\sin\theta - 1 = 0$ is to be satisfied for exactly 4 distinct values of $\theta \in [0, n\pi], n \in Z$, then the least values of n, is

A. 2

B. 6

C. 4

D. 1

Answer: D

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15. The number of integral values of k for which the equation $7\cos x + 5\sin x = 2k + 1$ has a solution is

A. 4

B. 8

C. 10

D. 112

Answer: B

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16. The number of solutions of the equation

$3\sin^2 x - 7\sin x + 2 = 0$

in the interval $[0, 5\pi]$, is

A. 0

B. 5

C. 6

D. 10

Answer: C

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17. The number of distinct real roots of $\begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0$ in the interval $-\frac{\pi}{4} \leq x \leq t\frac{\pi}{4}$ is

A. 0

B. 2

C. 1

D. 3

Answer: C

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18. If $\cos 2\theta, 1 \text{and } \sin\theta \text{are in GP., then } \theta =$

A. $n\pi + (-1)^2 \frac{\pi}{2}, n \in Z$

B. $n\pi + (-1)^{n-1} \frac{\pi}{2}, n \in Z$

C. $2n\pi, n \in Z$

D. none of these

Answer: B

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19. The equation $\sin^4 x - (k+2)\sin^2 x - (k+3) = 0$ possesses a solution, if

A. $k > -3$

B. $k < -2$

C. $-3 \leq k \leq -2$

D. $k \in Z$

Answer: C

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20. Let n be a positive integer such that $\sin\left(\frac{\pi}{2}n\right)+\cos\left(\frac{\pi}{2}n\right)=\frac{\sqrt{n}}{2}$

A. $n \in [6, 8]$

B. $n \in (4, 8]$

C. $n \in [4, 8)$

D. $n \in (4, 8)$

Answer: D

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21. The set of values of α for which the equation

$\sin^4 x + \cos^4 x + \sin 2x + \alpha = 0$ possesses a solution, is

A. $[-3/2, 1]$

B. $[0, 1/2]$

C. $[-3/2, 1/2]$

D. none of these

Answer: C

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22. If $2\tan^2\theta - 5\sec\theta = 1$ has exactly 7 solution in the interval $[0, n\pi/2], n \in N$, then the least and greatest values of n are

A. 6, 8

B. 12, 14

C. 13, 15

D. 15, 17

Answer: C

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23. The value of p for which the equation $3\ \sin^2 x + 12\cos x - 3 = p$ has at least one solution are

A. $p \leq 12$

B. $3 \leq p \leq 9$

C. $-15 \leq p \leq 9$

D. none of these

Answer: C

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24. The -number of solutions of the equation $\cos\left(\pi\sqrt{x-4}\cos\left(\pi\sqrt{x}\right)\right) = 1$ is

A. more than 2

B. 2

C. 1

D. 0

Answer: C

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25. If $mandn(n > m)$ are positive integers, then find the number of solutions of the equation $n|\sin x| = m|\cos x|f \text{ or } x \in [0, 2\pi]$. Also find the solution.

A. m

B. n

C. mn

D. none of these

Answer: D

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26. The number of solutions of the equation $\cos^7\theta + \sin^4\theta = 1$ in the interval $(-\pi, \pi)$, is

A. 0

B. 1

C. 2

D. 3

Answer: D

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27. The set of values of λ for which the equation $\sin^4 x + \cos^4 x = \lambda$ has a solution, is

A. $(0, 1)$

B. $(1, 3/2)$

C. $[-1, 1]$

D. $[1/2, 1]$

Answer: D

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28. Solve the equation $(\sin x + \cos x)^{1+\sin 2x} = 2$, when $-\pi \leq x \leq \pi$.

A. $\frac{\pi}{2}$

B. π

C. $\frac{\pi}{4}$

D. none of these

Answer: C

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29. The number of values of x in $(0, \pi)$ satisfying the equation $(\sqrt{3}\sin x + \cos x)^{\sqrt{\sqrt{3}\sin 2x - \cos 2x + 2}} = 4$, is

A. 0

B. 1

C. 2

D. none of these

Answer: B

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30. The set of values of 'a' for which the equation $\sqrt{a}\cos x - 2\sin x = \sqrt{2} + \sqrt{2 - a}$ has a solution is

A. $(0, 2)$

B. $[0, 2]$

C. $(\sqrt{5} - 1, 2)$

D. $[\sqrt{5}-1, 2]$

Answer: D

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31. Solve: $16^{\sin\hat{}}(2x)16^{\cos\hat{}}(2x) = 10, 0 \leq x < 2\pi$

A. 2

B. 4

C. 6

D. 8

Answer: D

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32. If $\tan(\cot x) = \cot(\tan x)$, prove that : $\sin 2x = \frac{4}{(2n+1)\pi}$

A. $\sin 2x = \frac{2}{(2n+1)\pi}, n \in Z$

B. $\sin x = \frac{4}{(2n+1)\pi}, n \in Z$

C. $\sin 2x = \frac{4}{(2n+1)\pi}, n \in Z$

D. none of these

Answer: C

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33. If the equation $2\cos x + \cos 2\lambda x = 3$ has only one solution , then λ is

A. equal to 1

B. a rational number

C. an irrational number

D. none of these

Answer: C

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34. The least positive integral solution of $\sin\pi\left(x^2+x\right)-\sin\pi x^2=0$, is

A. a rational number

B. an irrational number of the form $\sqrt{\lambda}$

C. an irrational number of the form $\frac{\sqrt{\lambda}-1}{4}$, where λ is an odd integer

D. an irrational number of the firm $\frac{\sqrt{\lambda}+1}{4}$, where λ is an even integer.

Answer: C

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35. The equation $1+\sin^2 ax=\cos x$ has a unique solution then a is

A. equal to 1

B. a rational number

C. an irrational number

D. none of these

Answer: B

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36. General solution of $2^{\sin x} + 2^{\cos x} = 2^{1\frac{1}{\sqrt{2}}}$ is

A. $x = n\pi - \frac{\pi}{4}, n \in Z$

B. $x = n\pi + \frac{\pi}{4}, n \in Z$

C. $x = n\pi + (-1)^n \frac{\pi}{4}, n \in Z$

D. $x = 2n\pi \pm \frac{\pi}{4}, n \in Z$

Answer: B

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37. find all the possible triplets (a_1, a_2, a_3) such that $a_1 + a_2 \cos(2x) + a_3 \sin^2(x) = 0$ for all real x.

A. 0

B. 1

C. 3

D. infinite

Answer: D

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38. If $x \neq \frac{n\pi}{2}, n \in Z$ and $(\cos x)^{\sin^2 x - 3\sin x + 2} = 1$ Then, $x =$

A. $2n\pi + \frac{\pi}{2}, n \in Z$

B. $(2n+1)\pi - \frac{\pi}{2}, n \in Z$

C. $n\pi + (-1)^n \frac{\pi}{2}, n \in Z$

D. none of these

Answer: D

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39. The values of x in $(0, \pi)$ satisfying the equation.

$$\begin{vmatrix} 1+\sin^2 x & \sin^2 x & \sin^2 x \\ \cos^2 x & 1+\cos^2 x & \cos^2 x \\ 4\sin 2x & 4\sin 2x & 1+4\sin 2x \end{vmatrix} = 0, \text{ are}$$

A. $\frac{\pi}{12}, \frac{7\pi}{12}$

B. $\frac{5\pi}{12}, \frac{7\pi}{12}$

C. $\frac{7\pi}{12}, \frac{11\pi}{12}$

D. $\frac{\pi}{12}, \frac{11\pi}{12}$

Answer: C

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40. The set of values of 'a' for which the equation $\sin x(\sin x + \cos x) = a$ has real solutions, is

A. $[1 - \sqrt{2}, 1 + \sqrt{2}]$

B. $[2 - \sqrt{3}, 2 + \sqrt{3}]$

C. $[0, 2 + \sqrt{3}]$

D. $\left[\frac{1 - \sqrt{2}}{2}, \frac{1 + \sqrt{2}}{2}\right]$

Answer: D

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41. The solution set of $\sin\left(x - \frac{\pi}{4}\right) - \cos\left(x + \frac{3\pi}{4}\right) = 1$ and $\frac{2\cos 7x}{\cos 3 + \sin 3} > 2^{\cos 2x}$, is

A. $k\pi + (-1)^k \frac{\pi}{4}, k \in Z$

B. $(8k + 3)\frac{\pi}{4}, k \in Z$

C. $(8k + 1)\frac{\pi}{4}, k \in Z$

D. none of these

Answer: B

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42. The solution set of the equation

$(\sin 13^\circ)^{\cot 3x + \cot x} = \sin^2(4\pi - x) - \cos(3\pi - x)\cos(2\pi + x)$ is given by

A. $x = \frac{n\pi}{4}, n \neq 4\lambda, \lambda \in Z$

B. $x = \frac{n\pi}{2}, n \neq 2\lambda, \lambda \in Z$

C. $x = \frac{n\pi}{3}, n \in 3\lambda$

D. none of these

Answer: A

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43. The number of real solutions of the equation $\sin e^x \cos e^x = 2^{x-2} + 2^{-x-2}$, is

A. 0

B. 1

C. 2

D. infinite

Answer: A

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44. If $\sin x = \lambda$ has exactly one solution in $[0, 9\pi/4]$ then the number of values of λ, is

A. 0

B. 1

C. 2

D. 3

Answer: C

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45. Number of solution (s) of the equation $\left(\frac{2-\cos^2 x}{\sin x}\right)^3 + \left(\frac{3-\cos 2x}{\sin x}\right) = 0$ is

A. 0

B. 1

C. 2

D. infinite

Answer: A

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46. If the values of x between 0 and 2 π which satisfy the equation $\sin x|\cos x| = \frac{1}{2\sqrt{2}}$ are in A.P, then the common difference of the A.P, is

A. $\frac{\pi}{8}$

B. $\frac{\pi}{4}$

C. $\frac{3\pi}{8}$

D. $\frac{5\pi}{8}$

Answer: B

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47. The number of solutions of the equation $x^3 + x^2 + 4x + 2\sin x = 0$ in $0 \leq x \leq 2\pi$ is

A. 0

B. 1

C. 2

D. 4

Answer: B

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48. The number of solutions of the equation $\sin x = [1 + \sin x] + [1 - \cos x] \text{in} [0, 2\pi]$ is

A. 0

B. 1

C. 2

D. 6

Answer: A

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49. The set of values of x satisfying $[\sin(\cos x)] = -1$ is ($[.]$ denotes the greatest integer function)

A. $((4n+1)\pi, (4n+3)\pi), n \in Z$

B. $\left[(n+1)\frac{\pi}{2}, (4n+3)\frac{\pi}{2}\right], n \in Z$

C. $\left((4n+1)\frac{\pi}{2}, (4n+3)\frac{\pi}{2}\right), n \in Z$

D. none of these

Answer: C

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50. The number of solutions of the equation $2\tan x + x = \frac{12\pi}{5}$ in the interval $[0, 2\pi]$, is

A. 1

B. 2

C. 3

D. infinite

Answer: B

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51. The number of solutions of the equation $\sin x = |\cos \quad 3x| \quad \in [0, \pi]$, is

A. 3

B. 4

C. 5

D. 6

Answer: D

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52. The equation $|\sin x| = \sin x + 3 \text{has in} [0, 2\pi]$

A. no root

B. only one root

C. two roots

D. more than two roots

Answer: A

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53. The most general values of θ satisfying $2\cos\theta + \sqrt{3} = 0 \text{and } \sqrt{3}\tan\theta - 1 = 0$ are given by

A. $n\pi \pm \frac{\pi}{6}, n \in Z$

B. $2n\pi \pm \frac{\pi}{6}, n \in Z$

C. $2n\pi, \frac{7\pi}{6}, n \in Z$

D. none of these

Answer: C

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54. If $0 \leq x, y \leq \pi$ and $\sin x + \sin y = 2$, then $x + y =$

A. π

B. $\frac{\pi}{2}$

C. 3π

D. none of these

Answer: A

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55. If $0 \leq x, y \leq 2\pi$ and $\cos x + \cos y = -2$, then $\cos(x + y) =$

A. 0

B. 1

C. -1

D. none of these

Answer: B

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56. If $0 \leq x \leq 3\pi, 0 \leq y \leq 3\pi$ and $\cos x \cdot \sin y = 1$, then find the possible number of values of the orederd pair (x,y) .

A. 6

B. 12

C. 8

D. 15

Answer: A

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57. Number of ordered pairs (a, x) satisfying the equation $\sec^2(a+2)x + a^2 - 1 = 0;\ -\pi < x < \pi$ is

A. 2

B. 1

C. 3

D. infinite

Answer: C

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58. If $\sin^4 x + \cos^4 y + 2 = 4\sin x.\cos y$ and $0 \leq x, y \leq \frac{\pi}{2}$ then sin x + cos y is equal to

A. -2

B. 0

C. 2

D. none of these

Answer: C

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59. Find the smallest positive values of $x and y$ satisfying $x - y = \frac{\pi}{4} and \cot x + \cot y = 2$

A. $x = \frac{\pi}{6}, y = \frac{5\pi}{12}$

B. $x = \frac{5\pi}{12}, y = \frac{\pi}{6}$

C. $x = \frac{\pi}{3}, y = \frac{7\pi}{12}$

D. none of these

Answer: B

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60. If $x+y=\frac{2\pi}{3}$ and $\cos x+\cos y=\frac{3}{2}$, then

A. $x=\frac{\pi}{3}-n\pi$ and $y=n\pi, n\in Z$

B. $x=n\pi$ and $y=\frac{\pi}{3}-n\pi, n\in Z$

C. $x=n\pi+\frac{2\pi}{3}$and $y=n\pi, n\in Z$

D. none of these

Answer: D

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61. If $x+y=\pi/4$ and $\tan x+\tan y=1$, then $(n\in Z)$

A. $x=\frac{\pi}{2}-n\pi$and $y=n\pi, n\in Z$

B. $x=\frac{\pi}{4}-n\pi$and $y=n\pi, n\in Z$

C. $x=\frac{\pi}{4}-n\pi$ and $y=2n\pi, n\in Z$

D. none of these

Answer: B

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62. If $2\sin x - 1 \leq 0 \text{and} \quad x \in [0, 2\pi]$, then the solution set for x, is

A. $[\pi/6, 5\pi/6]$

B. $[0, \pi/6] \cup [5\pi/6, \pi]$

C. $[0, \pi/6] \cup [5\pi/6, 2\pi]$

D. none of these

Answer: C

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63. The solution set of the inequation $\cos x - \sin x \geq 1 \text{in} [0, 2\pi]$, is

A. $[0, \pi/4] \cup [7\pi/4, 2\pi]$

B. $[3\pi/2, 7\pi/4] \cup \{0\}$

C. $[3\pi/2, 2\pi] \cup \{0\}$

D. none of these

Answer: C

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64. The number of values of x in $[0, 2\pi]$ satisfying the equation $|\cos x - \sin x| \geq \sqrt{2}$ is

A. 0

B. 1

C. 2

D. none of these

Answer: C

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65. The number of values of x in $[0, 4\pi]$ satisfying the inequation $|\sqrt{3}\cos x - \sin x| \geq 2$, is

A. 0

B. 2

C. 4

D. 8

Answer: C

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66. Find the solution set for , $4\sin^2 x - 8\sin x + 3 \leq 0$ where $x \in [0, 2\pi]$

A. $[0, \pi/6]$

B. $[0, 5\pi/6]$

C. $[5\pi/6, 2\pi]$

D. $[\pi/6, 5\pi/6]$

Answer: D

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67. Find the number of solution of $\tan x + \sec x = 2\cos x$ in $[0, 2\pi]$

A. 2

B. 3

C. 0

D. 1

Answer: A

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68. The value of x for which $\sin\left(\cot^{-1}(1+x)\right) = \cos\left(\tan^{-1}x\right)$ is $\frac{1}{2}$ (b) 1 (c) 0 (d) $-\frac{1}{2}$

A. $\frac{1}{2}$

B. 1

C. 0

D. $-\frac{1}{2}$

Answer: D

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69. If $\begin{vmatrix} \cos(A+B) & -\sin(A+B) & \cos 2B \\ \sin A & \cos A & \sin B \\ -\cos A & \sin A & \cos B \end{vmatrix} = 0$ then B =

A. $(2n+1)\pi/2, n \in Z$

B. $n\pi, n \in Z$

C. $(2n+1)\pi, n \in Z$

D. $2n\pi, n \in Z$

Answer: A

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70. The number of values of x in the interval $[0, 3\pi]$ satisfying the equation $2\sin^2 x + 5\sin x - 3 = 0$ is

A. 6

B. 1

C. 2

D. 4

Answer: D

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71. For $0 < \theta < \frac{\pi}{2}$, the solution of $\sum_{m=1}^{6} \operatorname{cosec}\left(\theta + \frac{(m-1)\pi}{4}\right)\operatorname{cosec}\left(\theta + \frac{m\pi}{4}\right) = 4\sqrt{2}$ is(are);

A. $\frac{\pi}{4}$

B. $\frac{\pi}{6}$

C. $\frac{\pi}{12}$

D. $\frac{5\pi}{12}$

Answer: C::D

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72. Solve: $2\sin^2\theta + \sin^2 2\theta = 2$

A. $\frac{\pi}{6}$

B. $\frac{\pi}{12}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{2}$

Answer: D

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73. The set of value of the θ satisfying the inequation $2\sin^2\theta - 5\sin\theta + 2 > 0$, where $0 < \theta < 2\pi$, is

A. $\left(0, \frac{\pi}{6}\right) \cup \left(\frac{5\pi}{6}, 2\pi\right)$

B. $\left[0, \frac{\pi}{6}\right] \cup \left[\frac{5\pi}{6}, 2\pi\right]$

C. $\left[0, \frac{\pi}{3}\right)\right] \cup \left[\frac{2\pi}{3}, 2\pi\right]$

D. none of these

Answer: B

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74. The number of solutions of the pair of equations $2s \in^2 \theta - \cos 2\theta = 0\ 2\cos^2\theta - 3\sin\theta = 0$ in the interval $[0, 2\pi]$ is 0 (b) 1 (c) 2 (d) 4

A. 0

B. 1

C. 2

D. 4

Answer: C

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75. $\cos 2x = (\sqrt{2}+1)\left(\cos x - \frac{1}{\sqrt{2}}\right), \cos x \neq \frac{1}{2} \Rightarrow x \in$

A. $\left\{2n\pi \pm \frac{\pi}{3} : n \in Z\right\}$

B. $\left\{2n\pi \pm \frac{\pi}{6} : n \in Z\right\}$

C. $\left\{2n\pi + -\frac{\pi}{2} : n \in Z\right\}$

D. $\left\{2n\pi \pm \frac{\pi}{4} : n \in Z\right\}$

Answer: D

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76. The number of values of θ in the interval $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ such that $\theta \neq \frac{n\pi}{5}$ for $n = 0, \pm 1, \pm 2$ and $\tan\theta = \cot 5\theta$ as well as $\sin 2\theta = \cos 4\theta$, is

A. 4

B. 5

C. 7

D. 3

Answer: D

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77. The number of all possible values of θ, where $0 < \theta < \pi$, for which the system of equations $(y+z)\cos 3\theta = (xyz)\sin 3\theta$, $x\sin 3\theta = \frac{2\cos 3\theta}{y} + \frac{2\sin 3\theta}{z}$ and $(xyz)\sin 3$ have a solution (x_0, y_0, z_0) wiith $y_0 z_0 \neq 0$ is

A. 0

B. 2

C. 3

D. 4

Answer: C

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78. The values of x satisfying $\tan^{-1}(x+3) - \tan^{-1}(x-3) = \sin^{-1}\left(\frac{3}{5}\right)$ are

A. ± 4

B. 0, 4

C. $-4, 0$

D. 4, 5

Answer: A

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79. The number of solutions of the equation $\cos^2\left(x+\frac{\pi}{6}\right)+\cos^2 x-2\cos\left(x+\frac{\pi}{6}\right)\frac{\cos\pi}{6}=\frac{\sin^2\pi}{6}$ in interval $\left(\frac{-\pi}{2},\frac{\pi}{2}\right)$ is_____

A. 0

B. 1

C. 2

D. 3

Answer: C

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80. The number of distinct solutions of the equation $\frac{5}{4}\cos^2 2x + \cos^4 x + \sin^4 x + \cos^6 x + \sin^6 x = 2$ in the interval $[0, 2\pi]$ is

A. 4

B. 6

C. 8

D. 5

Answer: C

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81. Let $S = \left\{x\varepsilon(-\pi, \pi) : x \neq 0, +\frac{\pi}{2}\right\}$ The sum of all distinct solutions of the equation $\sqrt{3}\sec x + \operatorname{cosec} x + 2(\tan x - \cot x) = 0$ in the set S is equal to

A. $-\frac{7\pi}{9}$

B. $-\frac{2\pi}{9}$

C. 0

D. $\frac{5\pi}{9}$

Answer: C

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82. The number of $x \in [0, 2\pi]$ for which $\left|\sqrt{2\sin^4 x + 18\cos^2 x} - \sqrt{2\cos^4 x + 18\sin^2 x}\right| = 1$, is

A. 6

B. 4

C. 8

D. 2

Answer: B

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Section Ii Assertion Reason Type

1. Statement -1:If

exp

$\left\{\left(\sin^2 x + \sin^4 x + \sin^6 x + \ldots\right)\log_e 2\right]$ satisfie the equation$x^2 - 9x + 8 =$

.

Statement-2: The sum $\sin^2 x + \sin^4 x + \sin^6 x + \ldots. \infty$ is equal to $\tan^2 x$

A. Statement -1 is true, Statement-2 is true, Statement -2 is a correct explanation for Statement-1.

B. Statement -1 is True, Statement-2 is True, Statement -2 is not a correct explanation for Statement -1.

C. Statement-1 is True, Statement-2 is False.

D. Statement -1 is False, Statement-2 is True.

Answer: A

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2. Statement -1: If $2\sin 2x - \cos 2x = 1, x \neq (2n+1)\frac{\pi}{2}, n \in Z$, then $\sin 2x + \cos 2x = 5$

Statement-2: $\sin 2x + \cos 2x = \frac{1 + 2\tan x - \tan^2 x}{1 + \tan^2 x}$

A. Statement -1 is true, Statement-2 is true, Statement -2 is a correct explanation for Statement-1.

B. Statement -1 is True, Statement-2 is True, Statement -2 is not a correct explanation for Statement -1.

C. Statement-1 is True, Statement-2 is False.

D. Statement -1 is False, Statement-2 is True.

Answer: D

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3. Statement -1: $\cos^7 x + \sin^4 x = 1$ has only two nonzero solutions in the inteval $(-\pi, \pi)$

Statement-2: $\cos^5 x + \cos^2 x - 2 = 0$ is possible only when cos x = 1.

A. Statement -1 is true, Statement-2 is true, Statement -2 is a correct explanation for Statement-1.

B. Statement -1 is True, Statement-2 is True, Statement -2 is not a correct explanation for Statement -1.

C. Statement-1 is True, Statement-2 is False.

D. Statement -1 is False, Statement-2 is True.

Answer: B

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4. Statement-1: The number of solutions of the simultaneous system of equations

$2\sin^2\theta - \cos 2\theta = 0$

$2\cos^2\theta - 3\sin\theta = 0$ in the interval $[0, 2\pi]$ is two.

Statement-2: If $2\cos^2\theta - 3\sin\theta = 0$, then θ does not lie in in III or IV quadrant.

A. Statement -1 is true, Statement-2 is true, Statement -2 is a correct explanation for Statement-1.

B. Statement -1 is True, Statement-2 is True, Statement -2 is not a correct explanation for Statement -1.

C. Statement-1 is True, Statement-2 is False.

D. Statement -1 is False, Statement-2 is True.

Answer: A

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Exercise

1. The number of solutions of the equation $\tan\theta + \sec\theta = 2\cos\theta$ lying the interval $[0, 2\pi]$ is

A. 0

B. 1

C. 2

D. 3

Answer: C

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2. In a triangle ABC, angle A is greater than angle B. If the measures of angles A and B satisfy the equation $2\tan x - k\left(1 + \tan^2 x\right) = 0$, where k E (0, 1), then the measure of the angle Cis

A. $\pi/3$

B. $\pi/2$

C. $2\pi/3$

D. $5\pi/6$

Answer: C

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3. The general solution of $\sin x - 3\sin 2x + \sin 3x = \cos x - 3\cos 2x + \cos 3x$ is.

A. $n\pi + \frac{\pi}{8}$

B. $\frac{n\pi}{2} + \frac{\pi}{8}$

C. $(-1)n\left(\frac{n\pi}{2} + \frac{\pi}{8}\right)$

D. $2n\pi + \cos^{-1}\left(\frac{3}{2}\right)$

Answer: B

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4. The equation $(\cos p - 1)x^2 + \cos px + \sin p = 0$ where x is a variable, has real roots. then the interval of p may be any one of the following :

A. $(0, 2\pi)$

B. $(-\pi, 0)$

C. $(-\pi/2, \pi/2)$

D. $(0, \pi)$

Answer: D

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5. The solution of the equation $\cos^2\theta + \sin\theta + 1 = 0$ lies in the interval

A. $(-\pi/4, \pi/4)$

B. $(\pi/4, 3\pi/4)$

C. $(3\pi/4, 5\pi/4)$

D. $(5\pi/4, 7\pi/4)$

Answer: D

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6. If $\tan\theta + \tan 4\theta + \tan 7\theta = \tan\theta \cdot \tan 4\theta \cdot \tan 7\theta$, then $\tan\theta =$

A. $\frac{n\pi}{4}, n \in Z$

B. $\frac{n\pi}{7} + (-1)^n \frac{\pi}{2}$

C. $n\pi + (-1)^n \frac{5\pi}{6}$

D. $n\pi + (-1)^n \frac{7\pi}{6}$

Answer: C

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7. The general value of θ satisfying the equation $2\sin^2\theta - 3\sin\theta - 2 = 0$ is

A. $n\pi + (-1)^n \frac{\pi}{6}$

B. $n\pi + (-1)^n \frac{\pi}{2}$

C. $n\pi + (-1)^n \frac{5\pi}{6}$

D. $n\pi + (-1)^n \frac{7\pi}{6}$

Answer: D

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8. Find the general solution of the equation $(\sqrt{3}-1)\sin\theta + (\sqrt{3}+1)\cos\theta = 2$

A. $2n\pi \pm \frac{\pi}{4} + \frac{\pi}{12}$

B. $n\pi + (-1)^n \frac{\pi}{4} + \frac{\pi}{12}$

C. $2n\pi \pm \frac{\pi}{4} - \frac{\pi}{12}$

D. $n\pi + (-1)^n \frac{\pi}{4} - \frac{\pi}{12}$

Answer: A

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9. The most general values of θ satisfying the two equations $\cos\theta = -\frac{1}{\sqrt{2}}, \tan\theta = 1$ is

A. $2n\pi \pm \frac{5\pi}{4}$

B. $2n\pi + \frac{\pi}{4}$

C. $n\pi + \frac{5\pi}{4}$

D. $(2n+1)\pi + \frac{\pi}{4}$

Answer: D

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10. In a right angled triangle the hypotenuse is $2\sqrt{2}$ times the length of perpendicular drawn from the opposite vertex, on the hypertenuse, then the other two angles, are

A. $\frac{\pi}{3}, \frac{\pi}{6}$

B. $\frac{\pi}{4}, \frac{\pi}{4}$

C. $\frac{\pi}{8}, \frac{3\pi}{8}$

D. $\frac{\pi}{12}, \frac{5\pi}{12}$

Answer: C

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11. The set of values of x for which $\frac{\tan 3x - \tan 2x}{1 + \tan 3x \tan 2x} = 1$, is

A. ϕ

B. $\left\{\frac{\pi}{4}\right\}$

C. $\left\{n\pi + \frac{\pi}{4}, n = 0, 1, 2, 3, \ldots\right\}$

D. $\left\{2n\pi + \frac{\pi}{4}, n = 1, 2, 3, . .\right\}$

Answer: C

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12. The value of θ , lying between $\theta = 0$ and $\theta = \frac{\pi}{2}$ and satisfying the equation . $\begin{vmatrix} 1+\cos^2\theta & \sin^2\theta & 4\sin 4\theta \\ \cos^2\theta & 1+\sin^2\theta & 4\sin 4\theta \\ \cos^2\theta & \sin^2\theta & 1+4\sin 4\theta \end{vmatrix} = 0, is$

A. $\frac{11\pi}{24}, \frac{7\pi}{24}$

B. $\frac{7\pi}{24}, \frac{5\pi}{24}$

C. $\frac{5\pi}{24}, \frac{\pi}{24}$

D. $\frac{\pi}{24}, \frac{11\pi}{24}$

Answer: A

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13. The solution set of $(2\cos x - 1)(3 + 2\cos x) = 0$ in the interval $0 \leq x \leq 2\pi$, is

A. $\left\{\frac{\pi}{3}\right\}$

B. $\left\{\frac{\pi}{3}, \frac{5\pi}{3}\right\}$

C. $\left\{\frac{\pi}{3}, \frac{5\pi}{3}, \cos^{-1}\left(-\frac{3}{2}\right)\right\}$

D. none of these

Answer: B

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14. If $\tan 2\theta \tan\theta = 1$, then $\theta =$

A. $n\pi + \frac{\pi}{6}, n \in Z$

B. $n\pi \pm \frac{\pi}{6}, n \in Z$

C. $2n\pi \pm \frac{\pi}{6}, n \in Z$

D. none of these

Answer: B

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15. The general solution of the trigonometric equation $\sin x + \cos x = 1$ is given by $x = 2n\pi, n0, \pm 1, \pm 2$ $x = 2n\pi + \frac{\pi}{2}; n = 0, \pm 1, \pm 2, .$ $x = n\pi + (-1)^n \frac{\pi}{4} - \frac{\pi}{4} n = 0, \pm 1, \pm 2, noneofthese$

A. $x = 2n\pi$

B. $x = 2n\pi + \frac{\pi}{2}$

C. $x = n\pi + (-1)^n \frac{\pi}{4} - \frac{\pi}{4}$

D. none of these

Answer: C

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16. If $\sin 5x + \sin 3x + \sin x = 0$,then the value of x other than 0 lying between $0 \leq x \leq \frac{\pi}{2}$ is

A. $\frac{\pi}{6}$

B. $\frac{\pi}{12}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{4}$

Answer: C

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17. Find the general values of θ which satisfies the equation $\tan\theta = -1$ and $\cos\theta = \frac{1}{\sqrt{2}}$

A. $n\pi + \frac{7\pi}{4}$

B. $n\pi + (-1)^n \frac{7\pi}{4}$

C. $2n\pi + \frac{7\pi}{4}$

D. none of these

Answer: C

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18. The values of θ satisfying $\sin 7\theta = \sin 4\theta - \sin\theta$ and $0 < \theta < \frac{\pi}{2}$ are

A. $\frac{\pi}{9}, \frac{\pi}{4}$

B. $\frac{\pi}{3}, \frac{\pi}{9}$

C. $\frac{\pi}{6}, \frac{\pi}{9}$

D. $\frac{\pi}{3}, \frac{\pi}{4}$

Answer: A

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19. If α, β are the different values of x satisfying $a\cos x + b\sin x = c$ then $\tan\left(\frac{\alpha+\beta}{2}\right)$ is

A. a+b

B. a-b

C. b/a

D. a/b

Answer: C

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20. The equation $a\sin x + b\cos x = c, \quad \text{where} |c| > \sqrt{a^2 + b^2}$ has

A. a unique solution

B. infinite no. of solutions

C. no solution

D. none of these

Answer: C

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21. If α is a root of $25\cos^2\theta + 5\cos\theta - 12 = 0, \frac{\pi}{2} < \alpha < \pi, \quad \text{then } \sin 2\alpha$ is equal to

A. $\frac{24}{25}$

B. $-\frac{24}{25}$

C. $\frac{13}{18}$

D. $-\frac{13}{18}$

Answer: B

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22. If $\cos 3x + \sin\left(2x - \frac{7\pi}{6}\right) = -2$, then x =

A. $\frac{\pi}{3}(6k+1), k \in Z$

B. $\frac{\pi}{3}(6k-1), k \in Z$

C. $\frac{\pi}{3}(2k+1), k \in Z$

D. none of these

Answer: A

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23. The number of solutions of $2\cos^2\left(\frac{x}{2}\right)\sin^2 x = x^2 + \frac{1}{x^2}, 0 \le x \le \frac{\pi}{2},$ is

A. 0

B. 1

C. infinite

D. none of these

Answer: A

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24. If A and B are acute positive angles satisfying the equations 3 $\sin^2 A + 2\sin^2 B = 1$ and $3\sin 2A - 2\sin 2B = 0$, then $A + 2B =$

A. 0

B. $\pi/2$

C. $\pi/4$

D. $\pi/3$

Answer: B

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25. The equation $\sin\theta = x + \frac{p}{x}$ for real values of x is possible when

A. $p > 0$

B. $p \leq 0$

C. $p \leq \frac{1}{4}$

D. $p \geq \frac{1}{2}$

Answer: C

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26. If $\sin A = \sin B, \cos A = \cos B,$ then the value of A im terms of B, is

A. $n\pi + 8$

B. $n\pi + (-1)^n B$

C. $2n\pi + B$

D. $2n\pi - B$

Answer: C

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27. Solve $5\cos 2\theta + 2\cos^2\frac{\theta}{2} + 1 = 0, \ -\pi < \theta < \pi.$

A. $\frac{\pi}{3}$

B. $\frac{\pi}{3}, \cos^{-1}(3/5)$

C. $\cos^{-1}(3/5)$

D. $\frac{\pi}{3}, \pi - \cos^{-1}(3/5)$

Answer: D

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28. If $(1+\tan\theta)(1+\tan\phi)=2$ then $\theta+\phi=$

A. 30°

B. 45°

C. 60°

D. 75°

Answer: B

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29. The general solution of $\tan 3x=1$, is

A. $n\pi+\frac{\pi}{4}$

B. $\frac{n\pi}{3} + \frac{\pi}{12}$

C. $n\pi$

D. $n\pi \pm \frac{\pi}{4}$

Answer: B

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30. If $1 + \sin\theta + \sin^2\theta + \sin^3\theta + .. \to \infty = 4 + 2\sqrt{3}$ $0<\theta<\pi$, $\theta \neq \frac{\pi}{2}$ then

A. $\frac{\pi}{6}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{3}$ or $\frac{\pi}{6}$

D. $\frac{\pi}{3}$ or $\frac{2\pi}{3}$

Answer: D

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31. If α and β are the solutions of the equation $a\tan\theta + b\sec\theta = c$ then $(\alpha + \beta) =$

A. $\frac{2ac}{a^2 - c^2}$

B. $\frac{2ac}{c^2 - a^2}$

C. $\frac{2ac}{a^2 + c^2}$

D. $\frac{ac}{a^2 + c^2}$

Answer: A

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32. Solve $\sin x + \sin y = \sin(x + y) and |x| + |y| = 1$

A. 2

B. 4

C. 6

D. infinite

Answer: C

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33. The expression $\left(1+\tan x+\tan^2 x\right)\left(1-\cot x+\cot^2 x\right)$ has the positive values for x, given by

A. $0 \leq x \leq \frac{\pi}{2}$

B. $0 \leq x \leq \pi$

C. for all$x \in R-\{0, \pi/2\}$

D. $x \geq 0$

Answer: C

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34. The equation $K - \sin\theta + \cos 2\theta = 2k - 7$ possesses a real solution if

A. $k > 6$

B. $2 \leq k \leq 6$

C. $k > 2$

D. none of these

Answer: B

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35. The equation $\sin^6 x + \cos^6 x = \lambda$, has a solution if

A. $\lambda \in [1/2, 1]$

B. $\lambda \in [1/4, 1]$

C. $\lambda \in [-1, 1]$

D. $\lambda \in [0, 1/2]$

Answer: B

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36. If $y + \cos\theta = \sin\theta$ has a real solution, then

A. $-\sqrt{2} \leq y \leq \sqrt{2}$

B. $y > \sqrt{2}$

C. $y \leq -\sqrt{2}$

D. none of these

Answer: A

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37. The solution set of the equation $4\sin\theta\cos\theta - 2\cos\theta - 2\sqrt{3}\sin\theta + \sqrt{3} = 0$ in the interval $(0, 2\pi)$, is

A. $\left\{\frac{3\pi}{4}, \frac{7\pi}{4}\right\}$

B. $\left\{\frac{\pi}{3}, \frac{5\pi}{3}\right\}$

C. $\left\{\frac{3\pi}{4}, \frac{7\pi}{4}, \frac{\pi}{3}, \frac{5\pi}{3}\right\}$

D. $\left\{\frac{\pi}{6}, \frac{5\pi}{6}, \frac{11\pi}{6}\right\}$

Answer: D

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38. The most general solution of $\tan\ \theta = -1, \cos\theta = \frac{1}{\sqrt{2}}$, is

A. $n\pi + \frac{7\pi}{4}, n \in Z$

B. $n\pi + (-1)^n \frac{7\pi}{4}, n \in Z$

C. $2n\pi + \frac{7\pi}{4}, n \in Z$

D. none of these

Answer: C

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39. If $\sin x + i\cos 2x$,and $\cos x - i\sin 2x$ are conjugate to each other then x=

A. $n\pi$

B. $\left(n + \frac{1}{2}\right)\pi, n \in Z$

C. 0

D. none of these

Answer: D

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

A. $(0, \pi/2)$

B. $(\pi/2, \pi)$

C. $(\pi, 3\pi/2)$

D. $(3\pi/2, 2\pi)$

Answer: C

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41. The number of solutions of the equation $\sin x = \cos 3x \text{in} [0, \pi]$ is

A. 1

B. 2

C. 3

D. 4

Answer: C

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42. The most general values oro satisfying $\tan\theta + \tan\left(\frac{3\pi}{4} + \theta\right) = 2$ are

A. $n\pi \pm \frac{\pi}{3}, n \in Z$

B. $2n\pi + \frac{\pi}{3}, n \in Z$

C. $2n\pi \pm \frac{\pi}{3}, n \in Z$

D. $n\pi + (-1)^n \frac{\pi}{3}, n \in Z$

Answer: A

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43. If $\sec\theta\tan\theta = \sqrt{2}, \text{then}\theta =$

A. $n\pi + (-1)^n \frac{\pi}{4}, n \in Z$

B. $2n\pi \pm \frac{\pi}{3}, n \in Z$

C. $n\pi \pm \frac{2\pi}{3}, n \in Z$

D. $n\pi - \frac{\pi}{4}, n \in Z$

Answer: A

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44. The 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

Answer: C

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45. If $\cot\theta\cot 7\theta + \cot\theta\cot 4\theta + \cot 4\theta\cot 7\theta = 1, \quad \text{then}\theta =$

A. $n\pi, n \in Z$

B. $(2n+1)\frac{\pi}{2}, n \in Z$

C. $n\pi + (-1)^n \frac{\pi}{2}, n \in Z$

D. $\frac{n\pi}{12}, n \in Z$

Answer: D

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46. The number of values of x in $[0, 5\pi]$ satisfying the equation $3\cos 2x - 10\cos x + 7 = 0$, is

A. 5

B. 6

C. 8

D. 10

Answer: C

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47. The number of values of $x \in [0, 2\pi]$ that satisfy $\cot x - \operatorname{cosec} x = 2\sin x$, is

A. 3

B. 2

C. 1

D. 0

Answer: D

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48. $\cot\theta = \sin 2\theta, \theta \neq n\pi, n \in Z$, if$\theta$ equals

A. $45^\circ \text{ or } 90^\circ$

B. $45^\circ \text{ or } 60^\circ$

C. 90° only

D. 45° only

Answer: A

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49. The solution of the equation

$\cos^2 x - 2\cos x = 4\sin x - \sin 2x (0 \leq x \leq \pi)$, is

A. $\pi - \cot^{-1}\frac{1}{2}$

B. $\pi - \tan^{-1} 2$

C. $\pi + \tan^{-1}\left(-\frac{1}{2}\right)$

D. none of these

Answer: C

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50. If $\frac{1}{6}\sin\theta, \cos\theta, \tan\theta$ are in $G\dot{P};$ then θ is equal to $(n \in Z)$ $2n\pi \pm \frac{\pi}{3}$ (b) $2n\pi \pm \frac{\pi}{6}$ $n\pi + (-1)^n \frac{\pi}{3}$ (d) $n\pi + \frac{\pi}{3}$

A. $2n\pi \pm \frac{\pi}{3}, n \in Z$

B. $2n\pi \pm \frac{\pi}{6}, n \in Z$

C. $n\pi + (-1)^n \frac{\pi}{3}, n \in Z$

D. $n\pi + \frac{\pi}{3}, n \in Z$

Answer: A

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51. Number of solutions of the equation $\sin 2\theta + 2 = 4\sin\theta + \cos\theta$ lying in the interval $[\pi, 5\pi]$ is

A. 0

B. 2

C. 4

D. 5

Answer: C

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52. If $\sin 2x, \frac{1}{2}$ and $\cos 2x$ are in A.P., then the general values of x are given by

A. $n\pi, n\pi + \frac{\pi}{2}, n \in Z$

B. $n\pi, n\pi + \frac{\pi}{4}, n \in Z$

C. $n\pi + \frac{\pi}{4}, n \in Z$

D. $n\pi, n \in Z$

Answer: B

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53. The number of points of intersection of the curves $2y = 1$ and $y = \sin x, -2\pi \leq x \leq 2\pi$, is

A. 2

B. 3

C. 4

D. 1

Answer: C

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54. For $m \neq n$, if $\tan m\theta = \tan n\theta$, then different values of θ are in

A. A.P

B. H.P

C. G.P

D. no particular sequence

Answer: D

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55. $\cos p\theta = \cos q\theta,\ p \neq q$,thetn

A. $\theta = 2n\pi, n \in Z$

B. $\theta = \dfrac{2n\pi}{p \pm q}, n \in Z$

C. $\theta = \dfrac{n\pi}{p + q}, n \in Z$

D. none of these

Answer: B

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56. Solutions of the equations $\cos^2\left(\frac{1}{2}px\right) + \cos^2\left(\frac{1}{2}qx\right) = 1$ form an arithmetic progression with common difference

A. $\frac{2}{p+q}$

B. $\frac{2}{p-q}$

C. $\frac{\pi}{p+q}$

D. none of these

Answer: D

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57. If $(\sec\theta 1) - \left(\sqrt{2}-1\right)\tan\theta$, then $\theta =$

A. $n\pi + \frac{\pi}{8}, n \in Z$

B. $2n\pi, 2n\pi + \frac{\pi}{4}, n \in Z$

C. $2n\pi, n \in Z$

D. none of these

Answer: B

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58. If $\sec^2\theta = \sqrt{2}\left(1 - \tan^2\theta\right)$, then$\theta =$

A. $n\pi + \frac{\pi}{8}, n \in Z$

B. $n\pi \pm \frac{\pi}{4}, n \in Z$

C. $n\pi \pm \frac{\pi}{8}, n \in Z$

D. none of these

Answer: C

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59. The most general solution of the equation

$8\tan^2\frac{\theta}{2} = 1 + \sec\theta,$ is

A. $\theta = 2n\pi \pm \cos^{-1}\left(\frac{1}{3}\right)$

B. $\theta = 2n\pi \pm \frac{\pi}{6}$

C. $\theta = 2n\pi \pm \cos^{-1}\left(\frac{-1}{3}\right)$

D. none of these

Answer: A

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60. The number of values of x for which $\sin 2x + \cos 4x = 2$, is

A. 0

B. 1

C. 2

D. infinite

Answer: A

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61. If $\sec(2\alpha) = \tan\beta + \cot\beta$, then one of the value of $\alpha + \beta$ is

A. $\frac{\pi}{4}$

B. $\frac{\pi}{2}$

C. π

D. none of these

Answer: A

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62. Quadratic equation $8\sec^2\theta - 6\sec\theta + 1 = 0$ has

A. exactlyk two roots

B. exactly four roots

C. infinitely many roots

D. no roots

Answer: D

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63. The equation $\sin x + \sin y + \sin z = -3$ for $0 \leq x \leq 2\pi$, $0 \leq y \leq 2\pi$, $o \leq z \leq 2\pi$, has

A. one solution

B. two sets of solution

C. four sets of solution

D. no solution

Answer: A

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64. The solution set of $(5+4\cos\theta)(2\cos\theta+1)=0$ in the interval $[0,\,2\pi]$

A. $\{\pi/3,\,2\pi/3\}$

B. $\{\pi/3,\,\pi\}$

C. $\{2\pi/3,\,4\pi/3\}$

D. $\{2\pi/3,\,5\pi/3\}$

Answer: C

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65. The solution of the equation $1-\cos\theta=\sin\theta\sin\frac{\theta}{2}$ is

A. $n\pi,\,n\in Z$

B. $2n\pi,\,n\in Z$

C. $\frac{n\pi}{2},\,n\in Z$

D. none of these

Answer: B

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66. $\{x \in R : \cos 2x + 2\cos^2 x = 2\}$ is equal to

A. $\left\{2n\pi + \frac{\pi}{3} : n \in Z\right\}$

B. $\left\{n\pi \pm \frac{\pi}{6} : n \in Z\right\}$

C. $\left\{n\pi + \frac{\pi}{3} : n \in Z\right\}$

D. $\left\{2n\pi - \frac{\pi}{3} : n \in Z\right\}$

Answer: B

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Chapter Test

1. If $|k| = 5$ and $0^\circ \leq \theta \leq 360^\circ$, then the number of different solution of $3\cos\theta + 4\sin\theta = k$ is

A. zero

B. two

C. one

D. infinite

Answer: B

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2. The number of all the possible triplets (a_1, a_2, a_3) such that $a_1 + a_2\cos(2x) + a_2\sin^2(x) = 0$ for all x is 0 (b) 1 (c) 3 (d) infinite

A. zero

B. 1

C. 2

D. infinite

Answer: D

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3. The number of all possible 5-tuples $(a_1, a_2, a_3, a_4, a_5)$ such that $a_1 + a_2 \sin x + a_3 \cos x + a_4 \sin 2x + a_5 \cos 2x = 0$ hold for all x is

A. zero

B. 1

C. 2

D. infinite

Answer: B

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4. The general solution of the equation $\cos x \cos 6x = -1$, is

A. $x = (2n+1)\pi, n \in Z$

B. $x = 2n\pi, n \in Z$

C. $x = (2n-1)\pi, n \in Z$

D. none of these

Answer: A

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5. The values of x satisfying the system of equation

$2^{\sin x + \cos y} = 1, 16^{\sin^2 x + \cos^2 y} = 4$ are given by

A. $x = n\pi + (-1)^n \frac{\pi}{6}$ and $y = 2n\pi \pm \frac{\pi}{3}, n \in Z$

B. $x = n\pi + (-1)^{n+1} \frac{\pi}{6}$ and $y = 2n\pi \pm \frac{2\pi}{3}, n \in Z$

C. $x = n\pi + (-1)^n \frac{\pi}{6}$ and $y = 2n\pi \pm \frac{2\pi}{3}, n \in Z$

D. $x = n\pi + (-1)^{n+1} \frac{\pi}{6}$ and $y = 2n\pi \pm \frac{\pi}{3}, n \in Z$

Answer: C

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6. The general solution of the equation $\tan 3x = \tan 5x$, is

A. $x = \frac{n\pi}{2}, n \in Z$

B. $x = n\pi, n \in Z$

C. $x = (2n+1)\pi, n \in Z$

D. none of these

Answer: A

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7. The number of all possible ordered pairs (x, y) x, y $\in$ R satisfying the system of equations

$x + y = \frac{2\pi}{3}, \cos x + \cos y = \frac{3}{2},$ is

A. 0

B. 1

C. infinite

D. none of these

Answer: A

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8. If the expression $\frac{\left[s \in \left(\frac{x}{2}\right) + \cos\left(\frac{x}{2}\right) - itan(x)\right]}{\left[1 + 2is \in \left(\frac{x}{2}\right)\right]}$ is real, then the set of all possible values of x is.....

A. $2n\pi + 2\tan^{-1}k, k \in R, n \in Z$

B. $2n\pi + 2\tan^{-1}k, \quad \text{where} \quad k \in (0, 1), n \in Z$

C. $2n\pi + 2\tan^{-1}k, \text{where} k \in (1, 2), n \in Z$

D. $2n\pi + 2\tan^{-1}k, k \in (2, 3), n \in Z$

Answer: C

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9. If the equation $\sec\theta + \operatorname{cosec}\theta = c$ has real roots between 0 and 2π, then

A. $c^2 < 8$

B. $c^2 > 8$

C. $c^2 = 8$

D. none of these

Answer: A

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10. If the equation $\sec\theta + \operatorname{cosec}\theta = c$ has real roots between 0 and 2π, then

A. $c^2 < 8$

B. $c^2 \geq 8$

C. $c^2 = 8$

D. none of these

Answer: B

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11. If $\theta_1, \theta_2, \theta_3, \theta_4$ are roots of the equation $\sin(\theta + \alpha) = k\sin 2\theta$ no two of which differ by a multiple of 2π, then $\theta_1 + \theta_2 + \theta_3 + \theta_4$ is equal to

A. $2n\pi, n \in Z$

B. $(2n + 1)\pi, n \in Z$

C. $n\pi, n \in Z$

D. none of these

Answer: B

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12. If $\sin(\pi\cos\theta) = \cos(\pi\sin\theta)$, then of the value $\cos\left(\theta \pm \frac{\pi}{4}\right)$ is

A. $\cos\frac{\pi}{4}$

B. $\frac{1}{2}\cos\frac{\pi}{4}$

C. $\cos\frac{\pi}{8}$

D. none of these

Answer: B

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13. If $\tan(\pi\cos\theta) = \cot(\pi\sin\theta)$, then the value(s) of $\cos\left(\theta - \frac{\pi}{4}\right)$, is (are)

A. $\frac{1}{2}$

B. $\frac{1}{\sqrt{2}}$

C. $\pm\frac{1}{2\sqrt{2}}$

D. none of these

Answer: C

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14. The general solution of $\tan\left(\frac{\pi}{2}\sin\theta\right) = \cot\left(\frac{\pi}{2}\cos\theta\right)$, is

A. $\theta = 2r\pi + \frac{\pi}{2}$

B. $\theta = 2r\pi$

C. $\theta = 2r\pi + \frac{\pi}{2}$ and $\theta = 2r\pi$

D. none of these

Answer: C

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15. The most general value of θ which satisfy both the equation $\cos\theta = -\frac{1}{\sqrt{2}}$ and $\tan\theta = 1$, is

A. $2n\pi + \frac{5\pi}{4}, n \in Z$

B. $2n\pi + \frac{\pi}{4}, n \in Z$

C. $2n\pi + \frac{3\pi}{4}, n \in Z$

D. none of these

Answer: A

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16. The number of roots of the equation $x + 2\tan x = \frac{\pi}{2}$ in the interval $[0, 2\pi]$, is

A. 1

B. 2

C. 3

D. infinite

Answer: C

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17. If $\sin(\pi\cot\theta) = \cos(\pi\tan\theta)$, then $\operatorname{cosec} 2\theta$ is equal to

A. $n - \frac{1}{4}$

B. $n + \frac{1}{4}$

C. 4n+1

D. 4n-1

Answer: B

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18. The number of distinct roots of the equation $A\sin^3 x + B\cos^3 x + C = 0$ no two of which differ by 2π, is

A. 3

B. 4

C. infinite

D. 6

Answer: D

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19. The values of x between 0 and 2π which satisfy the equation $\sin x\sqrt{8\cos^2 x} = 1$ are in A.P. with common difference is

A. $\frac{\pi}{4}$

B. $\frac{\pi}{8}$

C. $\frac{3\pi}{8}$

D. $\frac{5\pi}{8}$

Answer: A

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20. If $\cos 20^0 = k$ and $\cos x = 2k^2 - 1$, then the possible values of x between 0^0 and 360^0 are

A. 140°

B. 40° and 140°

C. 40° and 320°

D. 50° and 130°

Answer: C

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21. The general solution of the trigonometic equation $\sin x + \cos x = 1$ is given by

A. $x = 2n\pi$

B. $x = 2n\pi + \frac{\pi}{2}$

C. $x = n\pi + (-1)^n \frac{\pi}{4} - \frac{\pi}{4}$

D. none of these

Answer: C

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22. The general solution of the equation $\sin^2\theta \sec\theta + \sqrt{3}\tan\theta = 0$ is

A. $\theta = n\pi + (-1)^{n+1}\frac{\pi}{3}, \theta = n\pi$

B. $\theta = n\pi$

C. $\theta = n\pi + (-1)^{n+1}\frac{\pi}{3}$

D. $\theta = \frac{n\pi}{2}$

Answer: B

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23. If

$x = X\cos\theta - Y\sin\theta, y = X\sin\theta + Y\cos\theta$ and $x^2 + 4xy + y^2 = AX^2 + B$

, then

A. $\theta = \frac{\pi}{6}, A = 3, B = 1$

B. $\theta = \frac{\pi}{4}, A = 3, B = 1$

C. $A = 3, B = -1, \theta = \frac{\pi}{4}$

D. $A = -3, B = 1, \theta = \frac{\pi}{4}$

Answer: C

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24. The equation $3^{\sin 2x + 2\cos^2 x} + 3^{1 - \sin 2x + 2\sin^2 x} = 28$ is satisfied for the values of x given by

A. $\cos x = 0, \tan x = -1$

B. $\tan x = -1, \cos x = 1$

C. $\tan x = 1, \cos x = 0$

D. none of these

Answer: A

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25. The value of x $, 0 \leq x \leq \frac{\pi}{2}$ which satisfy the equation $81^{\sin^2 x} + 81^{\cos^2 x} = 30$ are

A. $\frac{\pi}{6}, \frac{\pi}{3}$

B. $\frac{\pi}{3}, \frac{5\pi}{2}$

C. $\frac{5\pi}{6}, \frac{\pi}{6}$

D. $\frac{2\pi}{3}, \frac{\pi}{3}$

Answer: A

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26. The smallest positive values of x and y which satisfy $\tan(x-y)=1, \sec(x+y)=\frac{2}{\sqrt{3}}$, are

A. $x=\frac{25\pi}{24}, y=\frac{7\pi}{24}$

B. $x=\frac{37\pi}{24}, y=\frac{19\pi}{24}$

C. $x=\frac{\pi}{4}, y=\frac{\pi}{2}$

D. $x=\frac{\pi}{3}, y=\frac{7\pi}{12}$

Answer: A

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27. The solution set of the inequality $\cos^2\theta < \frac{1}{2}$, is

A. $\left\{\theta : (8n+1)\frac{\pi}{4} < \theta(8n+3)\frac{\pi}{4}, n \in Z\right\}$

B. $\left\{\theta : (8n-3)\frac{\pi}{4} < \theta < (8n-1)\frac{\pi}{4}, n \in Z\right\}$

C. $\left\{\theta : (4n+1)\frac{\pi}{4} < \theta < (4n+3)\frac{\pi}{4}, n \in Z\right\}$

D. none of these

Answer: A,B

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28. The equation $\sin^4 x + \cos^4 x + \sin 2x + \alpha = 0$ is solvable for $-\frac{5}{2} \le \alpha \le \frac{1}{2}$ (b) $-3 \le \alpha < 1 - \frac{3}{2} \le \alpha \le \frac{1}{2}$ (d) $-1 \le \alpha \le 1$

A. $-\frac{1}{2} \le \alpha \frac{1}{2}$

B. $-3 \le \alpha \le 1$

C. $-\frac{3}{2} \le \alpha \le \frac{1}{2}$

D. $-1 \le \alpha \le 1$

Answer: C

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29. The equation $\sin^4 x - 2\cos^2 x + a^2 = 0$ is solvable if

A. $-\sqrt{3} \leq a \leq \sqrt{3}$

B. $-\sqrt{2} \leq a \leq \sqrt{2}$

C. $-1 \leq a \leq 1$

D. none of these

Answer: B

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30. Find the coodinates of the point of intersection of the curves $y = \cos x, y = \sin 3x$ if $-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$

A. $\left(\frac{\pi}{4}, \frac{1}{\sqrt{2}}\right)$ and $\left(\frac{\pi}{8}, \cos\frac{\pi}{8}\right)$

B. $\left(\frac{-\pi}{4}, \frac{1}{\sqrt{2}}\right)$ and $\left(\frac{-\pi}{8}, \cos\frac{\pi}{8}\right)$

C. $\left(\frac{\pi}{4}, \frac{-1}{\sqrt{2}}\right)$ and $\left(\frac{-\pi}{8}, -\cos\frac{\pi}{8}\right)$

D. $\left(\frac{-\pi}{4}, \frac{1}{\sqrt{2}}\right)$

Answer: A

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31. If $\frac{1}{6}\sin x, \cos x, \tan x$ are in G.P. then x=,

A. $n\pi \pm \frac{\pi}{3}, n \in Z$

B. (pi)/3

C. $n\pi + (-1)^n \frac{\pi}{3}, n \in Z$

D. none of these

Answer: B

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32. Find the minimum value of $2^{\sin x} + 2^{\cos x}$

A. 1

B. 2

C. $2^{-\frac{1}{\sqrt{2}}}$

D. $2^{1-\frac{1}{\sqrt{2}}}$

Answer: D

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33. From the identity $\sin 3x = 3\sin x - 4\sin^3 x$ it follows that if x is real and $|x| < 1$, then

A. $\left(3x - 4x^3\right) < 1$

B. $\left(3x - 4x^3\right) \leq 1$

C. $\left(3x - 4x^3\right) < 1$

D. none of these

Answer: B

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34. Find the most general solution of $2^{1|\cos x|} + \cos^2 x + |\cos x|^{3+\infty} = 4$

A. $x = n\pi \pm \frac{\pi}{3}, n \in Z$

B. $x = 2n\pi \pm \frac{\pi}{3}, n \in Z$

C. $x = 2n\pi + \frac{2\pi}{3}, n \in Z$

D. none of these

Answer: A

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35. Let α, β be any two positive values of x for which $2\cos x, |\cos x|$ and $1 - 3\cos^2 x$ are in G.P. The minimum value of $|\alpha - \beta|$, is

A. $\pi/3$

B. $\pi/4$

C. $\pi/2$

D. none of these

Answer: D

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36. If $\underset{x \in R}{\text{Max}}\{5\sin x + 3\sin(x - \theta)\} = 7$, then $\theta =$

A. $2n\pi \pm \frac{\pi}{3}, n \in Z$

B. $2n\pi \pm \frac{2\pi}{3}, n \in Z$

C. $\frac{\pi}{3}, \frac{2\pi}{3}$

D. none of these

Answer: A

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37. The most general value of θ for which

$\sin\theta - \cos\theta = \min_{x \in R}\left[1, x^2 - 4x + 6\right]$ are given by

A. $\theta = n\pi + (-1)^n \frac{\pi}{4} - \frac{\pi}{4}, n \in Z$

B. $\theta = n\pi + (-1)^n \frac{\pi}{4} + \frac{\pi}{4}, n \in Z$

C. $\theta = 2n\pi + \frac{\pi}{4}, n \in Z$

D. none of these

Answer: B

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38. The number of points of intersection of the two curves $y = 2\sin x$ and $y = 5x^2 + 2x + 3$ is

A. 0

B. 1

C. 2

D. ∞

Answer: A

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39. Let $2\sin^2 x + 3\sin x - 2 > 0$ and $x^2 - x - 2 < 0$ (x is measured in radian) . Then 'x' lies in the internal .

A. $(\pi/6, 5\pi/6)$

B. $(-1, 5\pi/6)$

C. $(-1, 2)$

D. $(\pi/6, 2)$

Answer: D

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40. The largest positive solution of $1 + \sin^4 x = \cos^2 3x$ in $[-5\pi/2, 5\pi/2]$, is

A. π

B. 2π

C. $\frac{5\pi}{2}$

D. none of these

Answer: B

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41. The set of values of x in $(-\pi, \pi)$ satisfying the inequation $|4\sin x - 1| < \sqrt{5}$, is

A. $(-\pi/10, 3\pi/10)$

B. $(-\pi/10, \pi)$

C. $(-\pi, \pi)$

D. $(-\pi, 3\pi/10)$

Answer: A

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42. If $\theta \in [0, 5\pi] and r \in R$ such that $2\sin\theta = r^4 - 2r^2 + 3$ then the maximum number of values of the pair (r, θ) is___

A. 6

B. 8

C. 10

D. none of these

Answer: A

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43. If $r\sin\theta = 3, r = 4(1+\sin\theta)$ where $0 \leq \theta \leq 2\pi$ then θ equal to

A. 0

B. 2

C. 4

D. none of these

Answer: B

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44. The solution set of the inequation

$\log_{1/2}\sin x > \log_{1/2}\cos x \text{in}[0, 2\pi]$, is

A. $(0, \pi/2)$

B. $(-\pi/4, \pi/4)$

C. $(0, \pi/4)$

D. none of these

Answer: C

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45. If the equation $\sin\theta(\sin\theta + 2\cos\theta) = a$ has a real solution, then the shortest interval containing 'a', is

A. $\left[\frac{1-\sqrt{5}}{2}, \frac{1+\sqrt{5}}{2}\right]$

B. $\left(\frac{\sqrt{5}-1}{2}, \frac{\sqrt{5}+1}{2}\right)$

C. $(-1/2, 1/2)$

D. none of these

Answer: A

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46. The equation $\sin^4\theta + \cos^4\theta = a$ has a real solution if

A. $a \in [1/2, 1]$

B. $a \in [1/4, 1/2]$

C. $a \in [1/3, 1]$

D. none of these

Answer: A

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47. If

$32\tan^8\theta = 2\cos\hat{}(2)\ \text{alpha-}\ 3\cos\ \ \text{alpha}\ \ \text{and}\ \ 3\cos\ \ 2\,\text{theta} = 1,\ \ then\alpha$

A. $2n\pi, n \in Z$

B. $2n\pi \pm \frac{2\pi}{3}, n \in Z$

C. $2n\pi \pm \frac{\pi}{3}, n \in Z$

D. $n\pi \pm \frac{\pi}{3}, n \in Z$

Answer: B

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48. The general value of θ satisfying $\tan\theta\tan(120^\circ - \theta)\tan(120^\circ + \theta) = \frac{1}{\sqrt{3}}$ is

A. $\frac{n\pi}{3} - \frac{\pi}{2}, n \in Z$

B. $\frac{n\pi}{3} - \frac{\pi}{18}, n \in Z$

C. $\frac{n\pi}{3} + \frac{\pi}{18}, n \in Z$

D. $\frac{n\pi}{3} + \frac{\pi}{12}, n \in Z$

Answer: C

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49. The solution of the equation

$\log_{\cos x} \sin x + \log_{\sin x} \cos x = 2$ is given by

A. $x = 2n\pi + \frac{\pi}{4}, n \in Z$

B. $x = n\pi + \frac{\pi}{2}, n \in Z$

C. $x = n\pi + \frac{\pi}{8}, n \in Z$

D. $x = 2n\pi + \frac{\pi}{6}, n \in Z$

Answer: A

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50. The 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

Answer: C

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51. One root of the equation $\cos\theta - \theta + \frac{1}{2} = 0$ lies in the interval

A. $(0, \pi/2)$

B. $(-\pi/2, 0)$

C. $(\pi/2, \pi)$

D. $(\pi, 3\pi/2)$

Answer: A

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52. If $\sin(\pi\cos\theta) = \cos(\pi\sin\theta)$, then which one fo the following is correct?

A. $\cos\theta = \frac{3}{\sqrt{3}}$

B. $\cos\left(\theta - \frac{\pi}{2}\right) = \frac{1}{\sqrt{2}}$

C. $\cos\left(\theta - \frac{\pi}{4}\right) = \frac{1}{2\sqrt{2}}$

D. $\cos\left(\theta + \frac{\pi}{4}\right) = \frac{1}{2\sqrt{2}}$

Answer: C

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53. If $2\sec(2\alpha) = \tan\beta + \cot\beta$, then one of the value of $\alpha + \beta$ is

A. π

B. $n\pi - \frac{\pi}{4}, n \in Z$

C. $\frac{\pi}{4}$

D. $\frac{\pi}{2}$

Answer: C

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54. The values of α for which the equation $\sin^4 x + \cos^4 x + \sin 2x + \alpha = 0$ may be valid, are

A. $-\frac{3}{2} \leq \alpha \leq 1$

B. $0 \leq \alpha \leq \frac{1}{2}$

C. $-\frac{3}{2} \leq \alpha \leq \frac{1}{2}$

D. none of these

Answer: C

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55. $\tan|x| = |\tan x|$, if

A. $x \in \left(-k\pi, (2k-1)\frac{\pi}{2} \right), k \in Z$

B. $x \in \left((2k-1)\frac{\pi}{2}, k\pi \right), k \in Z$

C. $x \in \left(-(2k+1)\frac{\pi}{2}, -k\pi \right) \cup \left(k\pi, (2k+1)\frac{\pi}{2} \right), k \in Z$

D. none of these

Answer: C

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56. The number of solutions of the equation $2^{\cos x} = |\sin x| \text{in}[-2\pi, 2\pi]$

A. 1

B. 2

C. 3

D. 4

Answer: D

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57. If sin x cos x cos 2x = λ has a solution, then λ lies in the interval

A. $[-1/4, 1/4]$

B. $[-1/2, 1/2]$

C. $(-\infty, -1/4] \cup [1/4, \infty)$

D. $(-\infty, -1/2] \cup [1/2, \infty)$

Answer: A

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58. If $\sin\ 3\theta = 4\sin\theta\left(\sin^2 x - \sin^2\theta\right), \theta \neq n\pi, n \in Z$. Then, the set of values of x, is

A. $\left\{n\pi \pm \frac{\pi}{3} : n \in Z\right\}$

B. $\left\{n\pi \pm \frac{2\pi}{3} : n \in Z\right\}$

C. $\left\{n\pi \pm \frac{\pi}{2} : n \in Z\right\}$

D. $\left\{n\pi \pm \frac{\pi}{4} : n \in Z\right\}$

Answer: A

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59. If $\sin 2x \cos 2x \cos 4x = \lambda$ has a solution then λ lies in the interval

A. $[-1/2, 1/2]$

B. $[-1/4, 1/4]$

C. $[-1/3, 1/3]$

D. none of these

Answer: B

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60. If the equation $\cos(\lambda\sin\theta) = \sin(\lambda\cos\theta)$ has a solution in $[0, 2\pi]$, then the smallest value of λ, is

A. $\frac{\pi}{\sqrt{2}}$

B. $\sqrt{2}\pi$

C. $\frac{\pi}{2}$

D. $\frac{\pi}{2\sqrt{2}}$

Answer: D

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