MATHS

BOOKS - CENGAGE

TRIGONOMETRIC EQUATIONS

Examples

1. Find the smallest positive root of the equation $\sqrt{\sin(1-x)} = \sqrt{\cos x}$

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

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3. Solve the equation $\tan^4 x + \tan^4 y + 2\cot^2 x \cot^2 y = 3 + \sin^2(x+y)$ for the values of $xandy.$

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4. If $(1-\tan\theta)(1+\tan\theta)\sec^2\theta + 2^{\tan^2\theta} = 0$ then in the interval $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$, the value of θ is

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5. For which values of a does the equation $4\sin\left(x+\frac{\pi}{3}\right)\cos\left(x-\frac{\pi}{6}\right) = a^2 + \sqrt{3}\sin 2x - \cos 2x$ have solution? Find the solution for $a-0, anye\xi sts.$

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6. Solve the following system of simultaneous equation for $x and y$.

$4^{\sin x} + 3^{1/\cos y} = 11\ 5x16^{\sin x} - 2x3^{1/\cos y} = 2$

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7. $\sin^{10} x + \cos^{10} x = \frac{29}{16}\cos^4 2x$

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8. Find the number of solution of the equation $1 + e^{\cot^2 x} = \sqrt{2|\sin x| - 1} + \frac{1 - \cos 2x}{1 + \sin^4 x}$ for $x \in (0, 5\pi)$.

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9. Find the number of solution of $\theta \in [0, 2\pi]$ satisfying the equation

$\left((\log)_{\sqrt{3}} \tan\theta\left(\sqrt{(\log)_{\tan\theta} 3 + (\log)_{\sqrt{3}} 3\sqrt{3}} = -1\right.\right.$

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10. Prove that the equation $2s \in x|x| + a$ has not solution for $a \in \left(\frac{3\sqrt{3} - \pi}{3} - \infty\right)$.

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11. Solve $\frac{\sin^2(x1)}{4}\sin^2 3x = \sin x \sin^2 3x$

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12. The equation $2\cos^2\left(\frac{x}{2}\right)\sin^2 x = x^2 + x^{-2}; 0 \leq x \leq \frac{\pi}{2}$ has

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13. Find general value of θ which satisfies both $\sin\theta = -1/2$ and $\tan\theta = 1/\sqrt{3}$ simultaneously.

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14. Find the value of θ which satisfy $r\sin\theta = 3 and r = 44(1+\sin\theta), 0 \le \theta \le 2\pi.$

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15. If $\sin A = \sin B$ and $\cos A = \cos B,$ find all the values of A in terms of B.

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16. Find the number of roots of the equation $16\sec^3\theta - 12\tan^2\theta - 4\sec\theta = 9$ in interval $(-\pi, \pi)$

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17. Find the number of solutions of $\sin^2 x - \sin x - 1 = 0 \in [-2\pi, 2\pi]$

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18. If $x \in (0, 2\pi) and y \in (0, 2\pi)$, then find the number of distinct ordered pairs (x, y) satisfying the equation $9\cos^2 x + \sec^2 y - 6\cos x - 4\sec y + 5 = 0$

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19. If $2\tan^2 x - 5\sec x = 1$ for exactly seven distinct value of $x \in \left[0, \frac{n\pi}{2}\right], n \in N$ then find the greatest value of n.

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

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21. Find the number of solution of the equation $e^{\sin x} - e^{-\sin x} - 4 = 0$

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22. Find the number of solution of $[\cos x] + |\sin x = 1 \in \pi \leq x \leq 3\pi$ (where [] denotes the greatest integer function).

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23. If the equation $ax + \cos 2x = 2a - 7$ possesses a solution, then find the value of a.

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24. 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.

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25. Find the number of solution of the equation $\sqrt{\cos 2x + 2} = (\sin x + \cos x)$ in $[0, \pi]$.

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26. Solve $\sin 2x = 4 \cos x$.

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27. Solve $\dfrac{\tan 3x - \tan 2x}{1 + \tan 3x \tan 2x} = 1.$

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28. Solve $\dfrac{3 \sin \theta - \sin 3\theta}{\sin \theta} + \dfrac{\cos 3\theta}{\cos \theta} = 1.$

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29. Show that

$\tan 3x \tan 2x \tan x = \tan 3x - \tan 2x - \tan x$

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30. Solve $2\cos^2\theta + 3\sin\theta = 0$

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31. Solve $4\cos\theta - 3\sec\theta = \tan\theta.$

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32. Solve $\sin^3\theta\cos\theta - \cos^3\theta\sin\theta = \frac{1}{4}.$

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33. Solve $\sqrt{5-2\sin x}=6\sin x-1$

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34. Solve $\frac{\frac{\sin^3 x}{2}-\frac{\cos^3 x}{2}}{2+\sin x}=\frac{\cos x}{3}$

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35. Solve $\frac{\sqrt{5}-1}{\sin x}+\frac{\sqrt{10+2\sqrt{5}}}{\cos x}=8, x\in\left(0,\frac{\pi}{2}\right)$

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36. Find the general values of $xandy$ satisfying the equations $5\sin x\cos y=1and4\tan x=\tan y.$

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37. Solve $\sqrt{3}\sec 2\theta = 2$.

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38. Solve $\sin 2\theta + \cos\theta = 0$.

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39. Solve the equations:

$\cos\theta + \cos 3\theta = 2\cos 2\theta$

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40. Solve $\sec 4\theta - \sec 2\theta = 2$.

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41. Solve : `5cos2theta+2cos^2theta/2+1=0,-pi

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42. If $(\cos\theta + \cos 2\theta)^3 = \cos^3\theta + \cos^3 2\theta,$ then the least positive value of θ is equal to $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{2}$

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43. $\cos(x)\cos(2x)\cos(3x) = \frac{1}{4}$. Find the general solution.

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44. Solve the equation $\frac{\sqrt{3}}{2}\sin x - \cos x = \cos^2 x$

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45. Solve $8\sin x = \frac{\sqrt{3}}{\cos x} + \frac{1}{\sin x}$

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46. Solve the equation

$2(\cos x + \cos 2x) + \sin 2x(1_2 \cos x) = 2s \in xf \text{ or } x(-\pi \leq x \leq \pi)$

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47. Solve $\tan 3\theta = -1$.

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48. Solve: $2\tan\theta - \cot\theta = -1$

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49. Solve $\tan 5\theta = \cot 2\theta$.

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50. Solve $\left(\tan^2 x + 2\sqrt{3}\tan x + 7\right)\left(\cot^2 y - 2\sqrt{3}\cot y + 8\right) \leq 20$ for x and y.

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51. Solve $\tan\theta + \tan 2\theta + \sqrt{3}\tan\theta\tan 2\theta = \sqrt{3}$.

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52. Find common roots of the equations $2\sin^2 x + \sin^2 2x = 2 and \sin 2x + \cos 2x = \tan x$.

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53. Solve $2\sin^2 x - 5\sin x\cos x - 8\cos^2 x = -2$.

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54. Find the number of roots of the equation $\tan\left(x+\frac{\pi}{6}\right)=2\tan x$, f or $x \in (0, 3\pi)$.

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55. Solve $\sin x - 3\sin 2x + \sin 3x = \cos x - 3\cos 2x + \cos 3x$

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56. Solve $7\cos^2\theta + 3\sin^2\theta = 4$.

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57. the least positive value of x satisfying (sin^2 2x + 4 sin^4 x - 4 sin^2x cos^2x)/(4-sin^2(2x)-4sin^2 x)= 1/9 is

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58. Solve $(\log)_{\tan x}\left(2+4\cos^2 x\right)=2$

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59. Solve $4\cot 2\theta=\cot^2\theta-\tan^2\theta$

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

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61. Solve the equation $\sqrt{3}\cos x+\sin x=\sqrt{2}$.

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62. Solve $\sqrt{3}\cos\theta-3\sin\theta=4\sin 2\theta\cos 3\theta$.

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63. Find the number of integral value of n so that $\sin x(\sin x + \cos x) = n$ has at least one solution.

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

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65. For what value of k the equation $\sin x + \cos(k + x) + \cos(k - x) = 2$ has real solutions?

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

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67. If $x, y \in [0, 2\pi]$, then find the total number of ordered pairs (x, y) satisfying the equation $\sin x \cos y = 1$

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68. Find the number of solution of $\sin^2 x \cos^2 x = 1 + \cos^2 x \sin^4 x$ in the interval $[0, 2\pi]$.

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69. If $3\sin x + 4\cos ax = 7$ has at least one solution, then find the possible values of a.

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70. Solve $\cos^{50} x - \sin^{50} x = 1$

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71. Solve $\sin^2 x + \cos^2 y = 2\sec^2 z$ for $x, y, and z$.

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72. Solve $1 + \sin x \sin^2\left(\frac{x}{2}\right) = 0$

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73. Solve $\cos 4\theta + \sin 5\theta = 2.$

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74. Solve for

$x and y: \sqrt{3}\sin x + \cos x = 8y - y^2 - 18, where 0 \leq x \leq 4\pi, y \in R$

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75. Solve the equation:

$$\cos^2\left[\frac{\pi}{4}\left(\sin x + \sqrt{2}\cos^2 x\right)\right] - \tan^2\left[x + \frac{\pi}{4}\tan^2 x\right] = 1$$

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76. Find the number of solutions of $\sin x = \frac{x}{10}$

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77. Find the number of roots of equation $x \sin x = 1$

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78. Prove that the least positive value of x, satisfying $\tan x = x + 1$, lies in the interval $\left(\frac{\pi}{4}, \frac{\pi}{2}\right)$

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

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80. Solve $\sin^{-1} x > -1$

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81. Solve $x^2 < \sin\frac{\pi}{2}x$.

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82. Solve `sintheta+sqrt(3)costhetageq1,-pi

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83. Solve $\cos 2x = |\sin x|, x \in \left(-\frac{\pi}{2}, \pi\right)$.

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Exercise 4.1

1. Solve $\sin^2\theta - \cos\theta = \frac{1}{4}, 0 \leq \theta \leq 2\pi$.

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2. The real roots of the equation $\cos^7 x + \sin^4 x = 1$ in the interval $(-\pi, \pi)$ are _____, _____, and _____

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3. Find the general solution of $(1-2\cos\theta)^2+\left(\tan\theta+\sqrt{3}\right)^2=0.$

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4. Solve $\sin 3\theta-\sin\theta=4\cos^2\theta-2.$

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5. Solve $\cos 2x=|\sin x|, x\in\left(-\frac{\pi}{2},\pi\right).$

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6. Solve the equation $\sin^4 x+\cos^4 x-2\sin^2 x+\sin^2 2x=0$

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7. Find number of solution of the equation $2\sin x + 5\sin^2 x + 8\sin^3 x + \ldots\infty = 1$ for $x \in [0, 2\pi]$.

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8. The solution set of the system of equations $x + y = \frac{2\pi}{3}, \cos x + \cos y = \frac{3}{2}$, where $xandy$ are real, is _____

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9. Solve $\cos ec^2\theta - \cot^2\theta = \cos\theta$.

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10. Solve $\sin x \tan x - \sin x + \tan x - 1 = 0$ for $x \in [0, 2\pi]$.

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11. Find number of solutions of equation

$$\sin^2\theta - \frac{4}{\sin^3\theta - 1} = 1 - \frac{4}{\sin^3\theta - 1}, \theta \in [0, 6\pi].$$

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12. Solve $\log_{|\sin x|}(1 + \cos x) = 2.$

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Exercise 4.2

1. Solve $2\sin\theta + 1 = 0.$

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2. $\sin^2 n\theta - \sin^2(n-1)\theta = \sin^2\theta$ where n is constant and $n \neq 0, 1$

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3. Solve $\cos\theta + \cos 7\theta + \cos 3\theta + \cos 5\theta = 0$,

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4. Solve $3\tan^2\theta - 2\sin\theta = 0$.

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5. If $\sin\theta$, 1, $\cos 2\theta$ are in G.P., then find the general values of θ

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6. Solve

$(\sin 10^\circ)^{\tan x + \tan 3x} = \tan 15^\circ + \tan 30^\circ + \tan 15^\circ . \tan 30^\circ, x \in (0, \pi]$

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Exercise 4.3

1. Solve $\cos\theta = 1/3$.

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2. Solve $\tan\theta\tan 4\theta = 1$ for $- < \theta < \pi$.

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3. Solve $\cot(x/2) - \cos ec(x/2) = \cot x$.

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4. Solve $\cot\theta + \tan\theta = 2\cos ec\theta$.

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5. Solve $\sin 6\theta = \sin 4\theta - \sin 2\theta$.

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6. Solve $\cos\theta + \cos 2\theta + \cos 3\theta = 0$.

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7. Determine the smallest positive value of x which satisfy the equation $\sqrt{1+\sin 2x} - \sqrt{2}\cos 3x = 0$

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8. If $\cos p\theta + \cos q\theta = 0$, then prove that the different values of θ are in A.P. with common difference $2\pi/(p \pm q)$.

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9. Find the number of solutions for the equation $\sin 5x + \sin 3x + \sin x = 0$ for $0 \leq x \leq \pi$.

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Exercise 4.4

1. If $\tan a\theta - \tan b\theta = 0$, then prove that the values of θ forms an A.P.

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2. What is the general solution of the equation: $\tan^2\theta + 2\sqrt{3}\tan\theta = 1$?

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3. Solve the following equation: $\tan^2 x + \left(1 - \sqrt{3}\right)\tan x - \sqrt{3} = 0$

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4. Solve the following equation: $3\cos^2\theta - 2\sqrt{3}\sin\theta\cos\theta - 3\sin^2\theta = 0$

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5. Solve the equations:

$$\tan\theta + \tan\left(\theta + \frac{\pi}{3}\right) + \tan\left(\theta + \frac{2\pi}{3}\right) = \sqrt{3}$$

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6. Solve $2\sin^3 x = \cos x$.

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

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8. If $\tan\left(\frac{p\pi}{4}\right) = \cot\left(\frac{q\pi}{4}\right)$, then prove that $p + q = 2(2n + 1), n \in Z.$

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9. Solve $\sec\theta - 1 = \left(\sqrt{2} - 1\right)\tan\theta.$

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Exercise 4.5

1. Solve $\tan^2\theta + \cot^2\theta = 2.$

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2. Solve $3\left(\sec^2\theta + \tan^2\theta\right) = 5.$

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3. Solve $4\cos^2 x + 6\sin^2 x = 5$.

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4. Solve $2^{\cos 2x} + 1 = 3.2^{-\sin^2 x}$

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5. Find the number of solution of the equation $\cot^2(\sin x + 3) = 1$ in $[0, 3\pi]$.

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Exercise 4.6

1. Solve the equations:

$\cot\theta + \cos ec\theta = \sqrt{3}$

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2. Solve $\sin\theta + \cos\theta = \sqrt{2}\cos A$.

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3. Solve $\sqrt{2}\sec\theta + \tan\theta = 1$.

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4. Find the number of integral values of k for which the equation $7\cos x + 5\sin x = 2k + 1$ has at least one solution.

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Exercise 4.7

1. Solve $\cos x + \cos 2x + \ldots + \cos(nx) = n, n \in N.$

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2. Show that $x = 0$ is the only solution satisfying the equation $1 + \sin^2 ax = \cos x$, where a is irrational.

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3. Solve $\sin^4 x = 1 + \tan^8 x.$

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4. Solve $\sin x\left(\cos\frac{x}{4} - 2\sin x\right) + \left(1 + \sin\frac{x}{4} - 2\cos x\right)\cos x = 0.$

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5. Solve for x and y $12\sin x - 2y^2 = 21 - 8y - 5\cos x$

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6. Solve $\sin 2x + \cos 4x = 2$.

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7. If the equation $\tan(P\cot x) = \cot(P\tan x)$ has a solution in $x \in (0, \pi) - \left\{\frac{\pi}{2}\right\}$, then prove that $P \leq \frac{\pi}{4}$.

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8. If $\tan^2\{\pi(x+y)\} + \cot^2\{\pi(x+y)\} = 1 + \sqrt{\frac{2x}{1+x^2}}$ where $x, y \in R$, then find the least possible value of y.

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9. Find the number of real solution of the equation $(\cos x)^5 + (\sin x)^3 = 1$ in the interval $[0, 2\pi]$

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Exercise 4.8

1. Find the number of solutions of the equation $\sin x = x^2 + x + 1$.

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2. The number of solution(s) of the equation $\sin x = \log_{10} x$ is/are

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3. Find the number of solution of the equation $2x = 3\pi(1 - \cos x)$.

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4. Solve $\tan x = [x], x \in (0, 3\pi/2)$. Here [.] represents the greatest integer function.

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Exercise 4.9

1. Solve $\sin^2\theta > \cos^2\theta$.

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2. Solve : $\tan x < 2$.

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3. Solve the inequality $\sin 2x > \sqrt{2}\sin^2 x + (2-\sqrt{2})\cos^2 x$

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4. Solve $\tan^3 x + 3 > 3\tan x + \tan^2 x$.

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5. Solve : $2\cos^2\theta + \sin\theta \leq 2$, where $\pi/2 \leq \theta \leq 3\pi/2$.

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6. Solve $\cos x > 1 - \frac{2x}{\pi}$.

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Exercise (Single)

1. If $\sin\theta = \frac{1}{2} and \cos\theta = -\frac{\sqrt{3}}{2}$, then the general value of θ is $(n \in Z) \cdot 2n\pi + \frac{5\pi}{6}$ (b) $2n\pi + \frac{\pi}{6}$ $2n\pi + \frac{7\pi}{6}$ (d) $2n\pi + \frac{\pi}{4}$

A. $2n\pi + \frac{5\pi}{6}$

B. $2n\pi + \frac{\pi}{6}$

C. $2n\pi + \frac{7\pi}{6}$

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

Answer: A

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2. The most general value for which $\tan\theta = -1 \cos\theta = \frac{1}{\sqrt{2}} is (n \in Z)$ $n\pi + \frac{7\pi}{4}$ (b) $n\pi + (-1)^n \frac{7\pi}{4}$ $2n\pi + \frac{7\pi}{4}$ (d) none of these

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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3. Sum of roots of the equation $x^2 - 2x^2 \frac{\sin^2(\pi x)}{2} + 1 = 0$ is 0 (b) 2 (c) 1 (d) 3

A. 0

B. 2

C. 1

D. 3

Answer: A

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4. The number of solution of the pair of equations $2\sin^2\theta - \cos 2\theta = 0 and 2\cos^2\theta = 0$ 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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5. Number of solutions of equation $2\sin\frac{x}{2}\cos^2 x - 2\sin\frac{x}{2}\sin^2 x = \cos^2 x - \sin^2 x$ for $x \in [0, 4\pi]$ is

A. 6

B. 8

C. 10

D. 12

Answer: C

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6. Number of solutions of the equation $4\left(\cos^2 2x + \cos 2x + 1\right) + \tan x\left(\tan x - 2\sqrt{3}\right) = 0$ in $[0, 2\pi]$ is

A. 0

B. 1

C. 2

D. 3

Answer: C

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7. Let $0 < \theta_1 < \theta_2 < \theta_3 <$ denote the positive solution of the equation $3 + 3\cos\theta = 2\sin^2\theta$ dot The value of $\theta_3 + \theta_7$ is

A. 6π

B. 7π

C. 8π

D. 4π

Answer: A

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8. Assume that θ is a rational multiple of π such that $\cos\theta$ is a distinct rational. The number of values of $\cos\theta$ is

A. 3

B. 4

C. 5

D. 6

Answer: C

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9. If $x, y \in [0, 2\pi]$ and $\sin x + \sin y = 2$, then the value of $x + y$ is

A. π

B. $\pi / 2$

C. 3π

D. none of these

Answer: A

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10. Number of roots of $\cos^2 x + \frac{\sqrt{3}+1}{2}\sin x - \frac{\sqrt{3}}{4} - 1 = 0$ which lie in the interval $[-\pi, \pi]$ is 2 (b) 4 (c) 6 (d) 8

A. 2

B. 4

C. 6

D. 8

Answer: B

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11. The sum of all the solutions of $\cot\theta = \sin 2\theta (\theta \neq n\pi, n \in te \geq r)$, $0 \leq \theta \leq \pi$, is $\frac{3\pi}{2}$ (b) π (c) $3\frac{\pi}{4}$ (d) 2π

A. $3\pi/2$

B. π

C. $3\pi/4$

D. 2π

Answer: A

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12. The number of solutions of $12\cos^3 x - 7\cos^2 x + 4\cos x = 9$ is

A. 0

B. 2

C. infinite

D. none of these

Answer: C

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13. Number of solutions of the equation $\sin x + \cos x - 2\sqrt{2}\sin x \cos x = 0$ for $x \in [0, \pi]$ is

A. 3

B. 0

C. 1

D. 2

Answer: D

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14. The general solution of $\frac{\tan 5x - \tan 4x}{1 + \tan 5x \tan 4x} = 1$ is

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

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

C. ϕ

D. $n\pi = \frac{\pi}{6}, \forall n \in Z$

Answer: A

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15. If $x \sin a + y \sin 2a + z \sin 3a = \sin 4a$ $x \sin b + y \sin 2b + z \sin 3b = \sin 4b$ $x \sin c + y \sin 2c + z \sin 3c = \sin 4c$ then the roots of the equation $t^3 - \left(\frac{z}{2}\right)t^2 - \left(\frac{y+2}{4}\right)t + \left(\frac{z-x}{8}\right) = 0$, $a, b, c, \neq n\pi$, are $\sin a, \sin b, \sin c$ (b) $\cos a, \cos b, \cos c$ $\sin 2a, \sin 2b, \sin 2c$ (d) $\cos 2a, \cos 2b \cos 2c$

A. $\cos a, \cos b, \cos c$

B. $\sin a, \sin b, \sin c$

C. $\sin 2a, \sin 2b, \sin 2c$

D. $\cos 2a, \cos 2b, \cos 2c$

Answer: A

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16. The number of solutions of the equation $\sin 2\theta - 2\cos\theta + 4\sin\theta = 4$ in $[0, 5\pi]$ is equal to

A. 3

B. 4

C. 5

D. 6

Answer: A

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17. The number of distinct real roots of the equation $\frac{\tan(2\pi x)}{x^2 + x + 1} = -\sqrt{3}$ is 4 (b) 5 (c) 6 (d) none of these

A. 4

B. 5

C. 6

D. none of these

Answer: B

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18. The smallest positive value of x (in radians) satisfying the equation $(\log)_{\cos x}\left(\frac{\sqrt{3}}{2}\sin x\right) = 2 - (\log)_{\sec x}(\tan x)$, is $\frac{\pi}{12}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{3}$

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

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

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

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

Answer: B

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19. The number of solution of $\sin^4 x - \cos^2 x \sin x + 2\sin^2 x + \sin x = 0$ in $0 \leq x \leq 3\pi$ is

A. 3

B. 4

C. 5

D. 6

Answer: B

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20. The range of 'y, such that the equation in x, $y + \cos x = \sin x$ has a real solution is

A. $[-2, 2]$

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

C. $[-1, 1]$

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

Answer: B

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21. Solution of the equation $\sin\left(\sqrt{1+\sin 2\theta}\right) = \sin\theta + \cos\theta$ is $(n \in Z)$

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

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

C. $n\pi + \frac{\pi}{6}$

D. none of these

Answer: A

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22. One of the general solutions of $\sqrt{3}\cos\theta - 3s\int h\eta = 4\sin 2\theta\cos 3\theta$ is $m\pi + \frac{\pi}{18}, m \in Z$ $\frac{m\pi}{2} + \frac{\pi}{6}, \forall m \in Z$ m $\frac{\pi}{3} + \frac{\pi}{18}, m \in Z$ none of these

A. $(3n \pm 1)\pi/12,\ \forall n \in Z$

B. $(4n \pm 1)\pi/9,\ \forall n \in Z$

C. $(3n \pm 1)\pi/9,\ \forall n \in Z$

D. $(3n \pm 1)\pi/3,\ \forall n \in Z$

Answer: C

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23. The general solution of the equation $8\cos x\cos 2x\cos 4x = \sin 6x/\sin x$ is

A. $x = (n\pi/7) + (\pi/21),\ \forall n \in Z$

B. $x = (2\pi/7) + (\pi/14),\ \forall n \in Z$

C. $x = (n\pi/7) + (\pi/14),\ \forall n \in Z$

D. $x = (n\pi) + (\pi/14),\ \forall n \in Z$

Answer: C

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24. $\frac{\sin^3\theta - \cos^3\theta}{\sin\theta - \cos\theta} - \frac{\cos\theta}{\sqrt{1+\cot^2\theta}} - 2\tan\theta\cot\theta = -1$ if

A. $\theta \in \left(0, \frac{\pi}{2}\right)$

B. $\theta \in \left(\frac{\pi}{2}, \pi\right)$

C. $\theta \in \left(\pi, \frac{3\pi}{2}\right)$

D. $\theta \in \left(\frac{3\pi}{2}, 2\pi\right)$

Answer: B

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25. For $0 < x, y < \pi$, the number of ordered pairs (x, y) satisfying system equations $\cot^2(x-y) - (1+\sqrt{3})\cot(x-y) + \sqrt{3} = 0$ and $\cos y = \frac{\sqrt{3}}{2}$ is

A. 0

B. 1

C. 2

D. 3

Answer: C

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26. The least positive solution of $\cot\left(\frac{\pi}{3\sqrt{3}}\sin 2x\right) = \sqrt{3}$ lie (a) $\left(0, \frac{\pi}{6}\right]$ (b) $\left(\frac{\pi}{9}, \frac{\pi}{6}\right)$ (c) $\left(\frac{\pi}{12}, \frac{\pi}{9}\right)$ (d) $\left(\frac{\pi}{3}, \frac{\pi}{2}\right)$

A. $\left(0, \frac{\pi}{6}\right]$

B. $\left(\frac{\pi}{9}, \frac{\pi}{6}\right)$

C. $\left(\frac{\pi}{12}, \frac{\pi}{9}\right]$

D. $\left(\frac{\pi}{3}, \frac{\pi}{2}\right]$

Answer: A

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27. The number of real roots of the equation $\cos ec\theta + \sec\theta - \sqrt{15} = 0$ ling in $[0, \pi]$ is. 6 (b) 8 (c) 4 (d) 0

A. 6

B. 8

C. 4

D. 0

Answer: C

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28. If $= \leq x \leq 2\pi,$ then the number of solutions of $3(\sin x + \cos x) - \left(\sin^3 x + \cos^3 x\right) = 8$ is 0 (b) 1 (c) 2 (d) 4

A. 0

B. 1

C. 2

D. 4

Answer: A

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29. If $2\sin^2\left(\left(\frac{\pi}{2}\right)\cos^2 x\right) = 1 - \cos(\pi s \in 2x), x \neq (2n+1)\frac{\pi}{2}, n \in I,$ then $\cos 2x$ is equal to $\frac{1}{5}$ (b) $\frac{3}{5}$ (c) $\frac{4}{5}$ (d) 1

A. $1/5$

B. $3/5$

C. $4/5$

D. 1

Answer: B

Watch Video Solution

30. The number of solutions of the equation $\cos 6x + \tan^2 x + \cos 6x \tan^2 x = 1$ in the interval $[0, 2\pi]$ is 4 (b) 5 (c) 6 (d) 7

A. 4

B. 5

C. 6

D. 7

Answer: D

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31. The number of solutions of the equation $\sin^3 x \cos x + \sin^2 x \cos^2 x + \sin x \cos^3 x = 1$ in the interval $[0, 2\pi]$ is/are 0 (b) 2 (c) 3 (d) infinite

A. 0

B. 2

C. 3

D. infinite

Answer: A

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32. The sum of all the solution of the equation $\cos\theta \cos\left(\frac{\pi}{3} + \theta\right)\cos\left(\frac{\pi}{3} - \theta\right) = \frac{1}{4}\theta \in [0, 6\pi]$ 15π (b) 30π (c) $\frac{100\pi}{3}$ (d) none of these

A. 15π

B. 30π

C. $\frac{100\pi}{3}$

D. none of these

Answer: B

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33. General solution of $\sin^2 x - 5\sin x \cos x - 6\cos^2 x = 0$ is

A. $x = n\pi - \pi/4, n \in Z$ only

B. $n\pi + \tan^{-1} 6, n \in Z$ only

C. both (a) and (2)

D. none of these

Answer: C

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34. about to only mathematics

A. 2

B. 4

C. 6

D. none of these

Answer: A

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35. General solution of $\tan\theta + \tan 4\theta + \tan 7\theta = \tan\theta \tan 4\theta \tan 7\theta$ is

A. $\theta = n\pi / 12$, where $n \in Z$

B. $\theta = n\pi / 9$, where $n \in Z$

C. $\theta = n\pi + \pi / 12$, where $n \in Z$

D. none of these

Answer: D

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36. The general solution of $\tan\theta + \tan 2\theta + \tan 3\theta = 0$ is

A. $\theta = n\pi/6, n \in Z$ only

B. $\theta = n\pi \pm \alpha, n \in Z$, where $\tan\alpha = 1/\sqrt{2}$ only

C. Both a and b

D. none of these

Answer: B

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37. The number of solution of $\sec^2\theta + \cos ec^2\theta + 2\cos ec^2\theta = 8, 0 \leq \theta \leq \pi/2$ is

A. 4

B. 3

C. 0

D. 2

Answer: D

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38. Which of the following is true for $z = (3 + 2i\sin\theta)(1 - 2\sin\theta) where i = \sqrt{-1}$? z is purely real for $\theta = n\pi \pm \frac{\pi}{3}, n \in Z$ z is purely imaginary for $\theta = n\pi \pm \frac{\pi}{2}, n \in Z$ z is purely real for $\theta = n\pi, n \in Z$ none of these

A. z is purely real for $\theta = n\pi \pm \pi/3, n \in Z$

B. z is purely imaginary for $\theta = n\pi \pm \pi/2, n \in Z$

C. z is purely real for $\theta = n\pi, n \in Z$

D. none of these

Answer: C

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39. The number of solution of $\sin x + \sin 2x + \sin 3x$

$= \cos x + \cos 2x + \cos 3x, 0 \leq x \leq 2\pi$, is

A. 7

B. 5

C. 4

D. 6

Answer: D

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40. Number of solution of the equation `cos^4 2x+2sin^2 2x=17(cosx+sinx)^8,0

A. 4

B. 8

C. 10

D. 16

Answer: A

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

A. 2

B. 4

C. 0

D. 1

Answer: A

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42. The value of k if the equation $2\cos x + \cos 2kx = 3$ has only one solution is (a) -2 (b) 2 (c) $\sqrt{2}$ (d) $\frac{1}{2}$

A. 0

B. 2

C. $\sqrt{2}$

D. $1/2$

Answer: C

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43. Number of solution(s) satisfying the equation $\frac{1}{\sin x} - \frac{1}{\sin 2x} = \frac{2}{\sin 4x}$ in $[0, 4\pi]$ equals 0 (b) 2 (c) 4 (d) 6

A. 0

B. 2

C. 4

D. 6

Answer: C

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44. The number of roots of $(1-\tan\theta)(1+\sin 2\theta)=1+\tan\theta$ for $\theta \in [0, 2\pi]$ is

A. 3

B. 4

C. 5

D. none of these

Answer: C

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45. If $\tan(A-B)=1 and \sec(A+B)=\frac{2}{\sqrt{3}}$, then the smallest positive values of A and B, respectively, are $\frac{25\pi}{24},\frac{19\pi}{24}$ (b) $\frac{19\pi}{24},\frac{25\pi}{24}$ $\frac{31\pi}{24},\frac{31\pi}{24}$ (d) $\frac{13\pi}{24},\frac{31\pi}{24}$

A. $\frac{25\pi}{24},\frac{19\pi}{24}$

B. $\frac{19\pi}{24},\frac{25\pi}{24}$

C. $\frac{31\pi}{24},\frac{13\pi}{24}$

D. $\frac{13\pi}{24},\frac{31\pi}{24}$

Answer: A

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46. If $3\tan\left(\theta-15^0\right)=\tan\left(\theta+15^0\right)$, then θ is equal to $n\in Z)$ $n\pi+\frac{\pi}{4}$ (b) $n\pi+\frac{\pi}{8}$ $n\pi+\frac{\pi}{3}$ (d) none of these

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

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

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

D. none of these

Answer: A

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47. If $\tan 3\theta + \tan\theta = 2\tan 2\theta$, then θ is equal to $(n \in Z)$

A. $n\pi$

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

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

D. none of these

Answer: A

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48. The solution of $4\sin^2 x + \tan^2 x + \cos ec^2 x + \cot^2 x - 6 = 0 is (n \in Z)$ $n\pi \pm \frac{\pi}{4}$ (b) $2n\pi \pm \frac{\pi}{4}$ $n\pi + \frac{\pi}{3}$ (d) $n\pi - \frac{\pi}{6}$

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

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

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

D. $n\pi - \frac{\pi}{6}$

Answer: A

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49. $\sin 3\alpha = 4\sin\alpha \sin(x+\alpha)\sin(x-\alpha)$

A. $n\pi \pm \pi/4, \forall n \in Z$

B. $n\pi \pm \pi/3, \forall n \in Z$

C. $n\pi \pm \pi/9, \forall n \in Z$

D. $n\pi \pm \pi/12,\ \forall n \in Z$

Answer: B

Watch Video Solution

50. The general solution of $4\sin^4 x + \cos^4 x = 1$ is

A. $n\pi \pm \alpha/2, \alpha = \cos^{-1}(1/5),\ \forall n \in Z$

B. $n\pi \pm \alpha/2, \alpha = \cos^{-1}(3/5),\ \forall n \in Z$

C. $2n\pi \pm \alpha/2, \alpha = \cos^{-1}(1/3),\ \forall n \in Z$

D. none of these

Answer: A

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51. For $n \in Z$, the general solution of $(\sqrt{3}-1)\sin\theta + (\sqrt{3}+1)\cos\theta = 2is(n \in Z)$ $\theta = 2n\pi \pm \frac{\pi}{4} + \frac{\pi}{12}$ $\theta = n\pi + (-1)^n \frac{\pi}{4} + \frac{\pi}{12}$ $\theta = 2n\pi \pm \frac{\pi}{4}$ $\theta = n\pi + (-1)^n \frac{\pi}{4} - \frac{\pi}{12}$

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

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

C. $\theta = 2n\pi \pm \frac{\pi}{4}$

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

Answer: A

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52. The value of $\cos y \cos\left(\frac{\pi}{2} - x\right) - \cos\left(\frac{\pi}{2} - y\right)\cos x + \sin y \cos\left(\frac{\pi}{2} - x\right) + \cos x \sin\left(\frac{\pi}{2}\right.$ is zero if $x = 0$ (b) $y = 0$ $x = y$ (d) $n\pi + y - \frac{\pi}{4}(n \in Z)$

A. $x = 0$

B. $y = 0$

C. $x = y$

D. $n\pi + y - \frac{\pi}{4}(n \in Z)$

Answer: D

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53. One of the general solutions of $\sqrt{3}\cos\theta - 3s\int h\eta = 4\sin 2\theta\cos 3\theta$ is $m\pi + \frac{\pi}{18}, m \in Z$ $\frac{m\pi}{2} + \frac{\pi}{6}, \forall m \in Z$ m $\frac{\pi}{3} + \frac{\pi}{18}, m \in Z$ none of these

A. $m\pi + \pi/18, m \in Z$

B. $m\pi/2 + \pi/6, \forall m \in Z$

C. $m\pi/3 + \pi/18, m \in Z$

D. none of these

Answer: C

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

A. $-5/2 \leq \alpha \leq 1/2$

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

C. $-3/2 \leq \alpha \leq 1/2$

D. $-1 \leq \alpha \leq 1$

Answer: C

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55. The total number of solution of $\cos x = \sqrt{1 - \sin 2x}$ in $[0, 2\pi]$ is equal to 2 (b) 3 (c) 5 (d) none of these

A. 2

B. 3

C. 5

D. none of these

Answer: B

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56. The total number of solution of $|\cot x| = \cot x + \frac{1}{\sin x}, x \in [0, 3\pi]$, is equal to 1 (b) 2 (c) 3 (d) 0

A. 1

B. 2

C. 3

D. 0

Answer: B

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57. Let $\alpha and \beta$ 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 $\frac{\pi}{3}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{2}$ (d) none of these

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

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

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

D. none of these

Answer: D

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58. The number of values of θ satisfying $4\cos\theta+3\sin\theta=5$ as well as $3\cos\theta+4\sin\theta=5$ is

A. one

B. two

C. zero

D. none of these

Answer: C

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59. The general solution of $\cos x \cos 6x = -1$ is

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

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

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

D. none of these

Answer: A

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60. The number of solution the equation $\cos(\theta).\cos(\pi\theta) = 1$ has 0 (b) 1 (c) 4 (d) 2

A. 0

B. 2

C. 1

D. infinite

Answer: C

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61. Let $\theta \in [0, 4\pi]$ satisfy the equation $(\sin\theta + 2)(\sin\theta + 3)(\sin\theta + 4) = 6$. If the sum of all the values of θ is of the form $k\pi$, then the value of k is 6 (b) 5 (c) 4 (d) 2

A. 6

B. 5

C. 4

D. 2

Answer: B

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62. The number of solutions of $\sum_{r=1}^{5} \cos rx = 5$ in the interval $[0, 2\pi]$ is 0 (b) 2 (c) 5 (d) 10

A. 0

B. 2

C. 5

D. 10

Answer: B

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63. If $\cos 3x + \sin\left(2x - \frac{7\pi}{6}\right) = -2$, then x is equal to $(k \in Z)$ $\frac{\pi}{3}(6k+1)$ (b) $\frac{\pi}{3}(6k-1)$ $\frac{\pi}{3}(2k+1)$ (d) none of these

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

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

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

D. none of these

Answer: D

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64. The general solution of the equation $\sin^{100} x - \cos^{100} x = 1$ is $2n\pi + \frac{\pi}{3}, n \in I$ (b) $n\pi + \frac{\pi}{2}, n \in I$ $n\pi + \frac{\pi}{4}, n \in I$ (d) $2n\pi = \frac{\pi}{3}, n \in I$

A. $2n\pi + \frac{\pi}{3}, n \in I$

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

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

D. $2n\pi - \frac{\pi}{3}, n \in I$

Answer: B

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65. The sum of all the solution in $[0, 4\pi]$ of the equation $\tan x + \cot x + 1 = \cos\left(x + \frac{\pi}{4}\right) is\ 3\pi$ (b) $\frac{\pi}{2}$ (c) $\frac{7\pi}{2}$ (d) 4π

A. 3π

B. $\pi/2$

C. $7\pi/2$

D. 4π

Answer: C

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66. The total number of solutions of $(\log)_e|\sin x| = -x^2 + 2x$ in $[0, \pi]$ is equal to 1 (b) 2 (c) 4 (d) none of these

A. 1

B. 2

C. 4

D. none of these

Answer: B

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67. The total number of solution of $\sin\{x\} = \cos\{x\}$ (where $\{\}$ denotes the fractional part) in $[0, 2\pi]$ is equal to 5 (b) 6 (c) 8 (d) none of these

A. 5

B. 6

C. 8

D. none of these

Answer: B

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68. The set of all $\xi n\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$ satisfying `|4sinx-1|

A. $\left(-\frac{\pi}{10}, \frac{3\pi}{10}\right)$

B. $\left(\frac{\pi}{10}, \frac{3\pi}{10}\right)$

C. $\left(\frac{\pi}{10}, \frac{3\pi}{10}\right)$

D. none of these

Answer: A

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69. If roots of the equation $2x^2 - 4x + 2\sin\theta - 1 = 0$ are of opposite sign, then θ belongs to $\left(\frac{\pi}{6}, \frac{5\pi}{6}\right)$ (b) $\left(0, \frac{\pi}{6}\right) \cup \left(\frac{5\pi}{6}, \pi\right)$ $\left(\frac{13\pi}{6}, \frac{17\pi}{6}\right)$ (d) $(0, \pi)$

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

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

C. $\left(\frac{13\pi}{6}, \frac{17\pi}{6}\right)$

D. $(0, \pi)$

Answer: B

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70. If $|2\sin\theta - \cos ec\theta| \geq 1$ and $\theta \neq \frac{n\pi}{2}, n \in Z$, then

A. $\cos 2\theta \geq 1/2$

B. $\cos 2\theta \geq 1/4$

C. $\cos 2\theta \leq 1/2$

D. $\cos 2\theta \leq 1/4$

Answer: A

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71. Which of the following is not the solution of the equation $\sin 5x = 16\sin^5 x (n \in Z)$?

A. $n\pi$

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

C. $n\pi - \frac{\pi}{6}$

D. none of these

Answer: D

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72. The number of solutions of the equation

$|2\sin x - \sqrt{3}|^{2\cos^2 x - 3\cos x + 1} = 1$ in $[0, \pi]$ is

A. 2

B. 3

C. 4

D. 5

Answer: B

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73. One of the root equation $\cos x - x + \frac{1}{2} = 0$ lies in the interval (a) $\left(0, \frac{\pi}{2}\right)$ (b) $\left(-\frac{\pi}{2, 0}\right)$ (c) $\left(\frac{\pi}{2}, \pi\right)$ (d) $\left(\pi, \frac{3\pi}{2}\right)$

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

B. $\left(-\frac{\pi}{2}, 0\right)$

C. $\left(\frac{\pi}{2}, \pi\right)$

D. $\left(\pi, \frac{3\pi}{2}\right)$

Answer: A

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74. The smallest positive x satisfying the equation $(\log)_{\cos x} \sin x + (\log)_{\sin x} \cos x = 2$ is $\frac{\pi}{2}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{6}$

A. $\pi/2$

B. $\pi/3$

C. $\pi/4$

D. $\pi/6$

Answer: C

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75. The number of ordered pairs which satisfy the equation $x^2 + 2x\sin(xy) + 1 = 0$ are (where $y \in [0, 2\pi]$) 1 (b) 2 (c) 3 (d) 0

A. 1

B. 2

C. 3

D. 0

Answer: B

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76. Consider the system of linear equations in $x, yandz$: $(\sin 3\theta)x - y + z = 0(\cos 2\theta)x + 4y + 3z = 0\ 3x + 7y + 7z = 0$ Which of the following can be the value of θ for which the system has a non-trivial solution $n\pi + (-1)^n \frac{\pi}{6}, \forall n \in Z$ $n\pi + (-1)^n \frac{\pi}{3}, \forall n \in Z$ $n\pi + (-1)^n \frac{\pi}{9}, \forall n \in Z$ none of these

A. $n\pi + (-1)^n \pi/6, \forall n \in Z$

B. $n\pi + (-1)^n \pi/3, \forall n \in Z$

C. $n\pi + (-1)^n \pi/9, \forall n \in Z$

D. none of these

Answer: A

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77. The equation $\sin^4 x - 2\cos^2 x + a^2 = 0$ can be solved if (a) $-\sqrt{3} \leq a \leq \sqrt{3}$ (b) $\sqrt{2} \leq a \leq \sqrt{2}$ (c) $-1 \leq a \leq a$ (d) none of these

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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78. If the inequality $\sin^2 x + a\cos x + a^2 > 1 + \cos x$ holds for any $x \in R,$ then the largest negative integral value of a is -4 (b) 3 (c) -2 (d) -1

A. -4

B. -3

C. -2

D. -1

Answer: B

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79. $\sin x + \cos x = y^2 - y + a$ has no value of x for any value of y if a belongs to $(0, \sqrt{3})$ (b) $(-\sqrt{3}, 0)$ $(-\infty, -\sqrt{3})$ (d) $(\sqrt{3}, \infty)$

A. $(0, \sqrt{3})$

B. $(-\sqrt{3}, 0)$

C. $(-\infty, -\sqrt{3})$

D. $(\sqrt{3}, \infty)$

Answer: D

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80. The number of solutions of $[\sin x + \cos x] = 3 + [-\sin x] + [-\cos x]$ (where [.] denotes the greatest integer function), $x \in [0, 2\pi]$, is

A. 0

B. 4

C. infinite

D. 1

Answer: C

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81. The equation $\cos^8 x + b\cos^4 x + 1 = 0$ will have a solution if b belongs to $(-\infty, 2]$ (b) $[2, \infty]$ (c) $[-\infty, -2]$ (d) none of these

A. $(-\infty, 2]$

B. $[2, \infty)$

C. $(-\infty, -2]$

D. none of these

Answer: C

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82. The number of values of $y \in [-2\pi, 2\pi]$ satisfying the equation $|\sin 2x| + |\cos 2x| = |\sin y|$ is 3 (b) 4 (c) 5 (d) 6

A. 3

B. 4

C. 5

D. 6

Answer: B

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83. If both the distinct roots of the equation $|\sin x|^2 + |\sin x| + b = 0 \in [0, \pi]$ are real, then the values of b are $[-2, 0]$ (b) $(-2, 0)$ $[-2, 0]$ (d) $none of these$

A. $[-2, 0]$

B. $(-2, 0)$

C. $[-2, 0)$

D. none of these

Answer: B

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84. $e^{|\sin x|} + e^{-|\sin x|} + 4a = 0$ will have exactly four different solutions in $[0, 2\pi]$ if. $a \in R$ (b) $a \in \left[-\frac{3}{4}, -\frac{1}{4}\right]$ $a \in \left[\frac{-1-e^2}{4e}, \infty\right]$ (d) none of these

A. $a \in R$

B. $a \in \left[-\frac{e}{4}, -\frac{1}{4}\right]$

C. $a \in \left[\frac{-1-e^2}{4e}, \infty\right]$

D. none of these

Answer: D

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85. The equation $\tan^4 x - 2\sec^2 x + a = 0$ will have at least one solution if A) 1 < a ≤ 4 B) a ≥ 2 C) a ≤ 3 D) None of these

A. $1 < a \leq 4$

B. $a \geq 2$

C. $a \leq 3$

D. none of these

Answer: C

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86. The total number of ordered pairs (x, y) satisfying $|x| + |y| = 2, \sin\left(\frac{\pi x^2}{3}\right) = 1,$ is equal to 2 (b) 3 (c) 4 (d) 6

A. 2

B. 3

C. 4

D. 6

Answer: C

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87. If $a, b \in [0, 2\pi]$ and the equation $x^2 + 4 + 3\sin(ax + b) - 2x = 0$ has at least one solution, then the value of $(a + b)$ can be $\frac{7\pi}{2}$ (b) $\frac{5\pi}{2}$ (c) $\frac{9\pi}{2}$ (d) none of these

A. $\frac{7\pi}{2}$

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

C. $\frac{9\pi}{2}$

D. none of these

Answer: A

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88. The sum of all roots of $\sin\left(\pi(\log)_3\left(\frac{1}{x}\right)\right) = 0$ in $(0, 2\pi)$ is $\frac{3}{2}$ (b) 4 (c) $\frac{9}{2}$ (d) $\frac{13}{3}$

A. $3/2$

B. 4

C. $9/2$

D. $13/3$

Answer: C

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89. Find the number of pairs of integer (x, y) that satisfy the following two equations: $\{\cos(xy) = x \tan(xy) = y$ 1 (b) 2 (c) 4 (d) 6

A. 1

B. 2

C. 4

D. 6

Answer: A

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90. If no solution of $3\sin y + 12\sin^3 x = a$ lies on the line $y = 3x,$ then

$a \in (-\infty, -9) \cup (9, \infty)$ a$a \in [-9, 9]$ $aa \in \{-9, 9\}$ $noneofthese$

A. $a \in (-\infty, -9) \cup (9, \infty)$

B. $a \in [-9, 9]$

C. $a \in \{-9, 9\}$

D. none of these

Answer: A

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Exercise (Multiple)

1. If $4\sin^4 x + \cos^4 x = 1, then\xi sequa < o(n \in Z)$ $n\pi$ (b) $n\pi \pm \sin^{-1}\sqrt{\frac{2}{5}}$ $\frac{2n\pi}{3}$ (d) $2n\pi \pm \frac{\pi}{4}$

A. $n\pi$

B. $n\pi \pm \sin^{-1}\sqrt{\frac{2}{5}}$

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

D. $2n\pi \pm \frac{\pi}{4}$

Answer: A::B

Watch Video Solution

2. If $\sin^3\theta + \sin\theta\cos\theta + \cos^3\theta = 1$, then θ is equal to $(n \in Z)$

A. $2n\pi$

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

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

D. $n\pi$

Answer: A::B

Watch Video Solution

3. A general solution of $\tan^2\theta + \cos 2\theta = 1$ is $(n \in Z)$

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

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

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

D. $n\pi$

Answer: A::C::D

Watch Video Solution

4. If $\sin x + \cos x = \sqrt{y + \frac{1}{y}}$ for $x \in [0, \pi]$, then (a) $x = \frac{\pi}{4}$ (b) $y = 0$ (c) $y = 1$ (d) $x = \frac{3\pi}{4}$

A. $x = \pi/4$

B. $y = 0$

C. $y = 1$

D. $x = 3\frac{\pi}{4}$

Answer: A::C

Watch Video Solution

5. If $2\sin^2\left(\left(\frac{\pi}{2}\right)\cos^2 x\right) = 1 - \cos(\pi s \in 2x), x \neq (2n+1)\frac{\pi}{2}, n \in I,$ then $\cos 2x$ is equal to $\frac{1}{5}$ (b) $\frac{3}{5}$ (c) $\frac{4}{5}$ (d) 1

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

B. $\tan x = \frac{1}{2}, n \in Z$

C. $\tan x = -\frac{1}{2}, n \in Z$

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

Answer: A::B::C

Watch Video Solution

6. If $\sin^2 x - 2\sin x - 1 = 0$ has exactly four different solutions in $x \in [0, n\pi]$, then value/values of n is/are $(n \in N)$ 5 (b) 3 (c) 4 (d) 6

A. 5

B. 3

C. 4

D. 6

Answer: A::C

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7. For the smallest positive values of $xandy$, the equation $2(s \in x + s \in y) - 2\cos(x - y) = 3$ has a solution, then which of the following is/are true? $\frac{\sin(x+y)}{2} = 1$ (b) $\cos\left(\frac{x-y}{2}\right) = \frac{1}{2}$ number of ordered pairs (x, y) is 2 number of ordered pairs $(x, y)is3$

A. $\sin\frac{x+y}{2} = 1$

B. $\cos\left(\frac{x-y}{2}\right) = \frac{1}{2}$

C. number of ordered pairs (x, y) is 2

D. number of ordered pairs (x, y) is 3

Answer: A::B::C

Watch Video Solution

8. For the equation $1 - 2x - x^2 = \tan^2(x + y) + \cot^2(x + y)$ exactly one value of x exists exactly two values of x exists $y = -1 + n\pi + \frac{\pi}{4}, n \in Z\, y = 1 + n\pi + \frac{\pi}{4}, n \in Z$

A. exactly one values of x exists

B. exactly two values of x exists

C. $y = -1 + n\pi + \pi/4, n \in Z$

D. $y = 1 + n\pi + \pi/4, n \in Z$

Answer: A::D

Watch Video Solution

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

A. $\sin x = 0$ always

B. when $x = n\pi + \pi/4$ then $y = -n\pi$

C. when $x = n\pi$ then $y = n\pi + (\pi/4)$

D. when $x = n\pi + \pi/4$ then $y = n\pi - (\pi/4)$

Answer: B::C

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10. If $x + y = 2\pi/3$ and $\sin x/\sin y = 2$, then the

A. number of values of $x \in [0, 4\pi]$ are 4

B. number of values of $x \in [0, 4\pi]$ are 2

C. number of values of $y \in [0, 4\pi]$ are 4

D. number of values of $y \in [0, 4\pi]$ are 8

Answer: A::C

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11. Let $\tan x - \tan^2 x > 0$ and $|2s \in x| < 1$. Then the intersection of which of the following two sets satisfies both the inequalities? $x > n\pi, n \in Z$ (b) $x > n\pi - \frac{\pi}{6}, n \in Z$ `x

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

B. $x > n\pi - \pi/6, n \in Z$

C. $x < n\pi - \pi/4, n \in Z$

D. $x < n\pi + \pi/6, n \in Z$

Answer: A::D

Watch Video Solution

12. If $\cos\left(x + \frac{\pi}{3}\right) + \cos x = a$ has real solutions, then number of integral values of a are 3 sum of number of integral values of $ais0$ when $a = 1$, number of solutions for $x \in [0, 2\pi]$ are 3 when $a = 1,$ number of solutions for $x \in [0, 2\pi]$ are 2

A. number of integral values of a are 3

B. sum of number of integral values of a is 0

C. when $a = 1$, number of solution for $x \in [0, 2\pi]$ are 3

D. when $a = 1$, number of solutions for $x \in [0, 2\pi]$ are 2

Answer: A::B::D

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13. If $0 \leq x \leq 2\pi$, then $2^{\cos e} c^{2x} \sqrt{\frac{1}{2}y^2 - y + 1} \leq \sqrt{2}$ is satisfied by exactly one value of y is satisfied by exactly one value of z is satisfied by x for which $\cos x = 0$ is satisfied by x for which $s \in x = 0$

A. is satisfied by exactly one value of y

B. is satisfied by exactly two value of x

C. is satisfied by x for which $\cos x = 0$

D. is satisfied by x for which $\sin x = 0$

Answer: A::B::C

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14. about to only mathematics

A. $a \in (-\infty, 1] \cup [2, \infty)$

B. $b \in (-\infty, 0] \cup [1, \infty)$

C. $a = 1 + b$

D. none of these

Answer: A::B::C

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15. If $\left(\cos ec^2\theta - 4\right)x^2 + \left(\cot\theta + \sqrt{3}\right)x + \frac{\cos^2(3\pi)}{2} = 0$ holds true for all real x, then the most general values of θ can be given by $n \in Z)$ $2n\pi + \frac{11\pi}{6}$ (b) $2n\pi + \frac{5\pi}{6}$ $2n\pi \pm \frac{7\pi}{6}$ (d) $n\pi \pm \frac{11\pi}{6}$

A. $2n\pi + \frac{11\pi}{6}$

B. $2n\pi + \frac{5\pi}{6}$

C. $2n\pi \pm \frac{7\pi}{6}$

D. $n\pi \pm \frac{11\pi}{6}$

Answer: A::B

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16. If $(\sin\alpha)x^2 - 2x + b \geq 2$ for all real values of $x \leq 1 and \alpha \in \left(0, \frac{\pi}{2}\right) \cup \left(\frac{\pi}{2}, \pi\right)$, then the possible real values of b is/are 2 (b) 3 (c) 4 (d) 5

A. 2

B. 3

C. 4

D. 5

Answer: C::D

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17. The value of x in $\left(0, \frac{\pi}{2}\right)$ satisfying $\frac{\sqrt{3}-1}{\sin x} + \frac{\sqrt{3}+1}{\cos x} = 4\sqrt{2} is/are \frac{\pi}{12}$ (b) $\frac{5\pi}{12}$ (c) $\frac{7\pi}{24}$ (d) $\frac{11\pi}{36}$

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

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

C. $\frac{7\pi}{24}$

D. $\frac{11\pi}{36}$

Answer: A::D

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18. If $\cos 3\theta = \cos 3\alpha,$ then the value of $\sin\theta$ can be given by $\pm\sin\alpha$ (b) $\sin\left(\frac{\pi}{3} \pm \alpha\right)$ $\sin\left(\frac{2\pi}{3} + \alpha\right)$ (d) $\sin\left(\frac{2\pi}{3} - \alpha\right)$

A. $\pm\sin\alpha$

B. $\sin\left(\frac{\pi}{3} \pm \alpha\right)$

C. $\sin\left(\frac{2\pi}{3} + \alpha\right)$

D. $\sin\left(\frac{2\pi}{3} - \alpha\right)$

Answer: A::C::D

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19. Which of the following sets can be the subset of the general solution of $1 + cas3x = 2\cos 2x (n \in Z)$? $n\pi + \frac{\pi}{3}$ (b) $n\pi + \frac{\pi}{6}$ $n\pi - \frac{\pi}{6}$ (d) $2n\pi$

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

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

C. $n\pi - \frac{\pi}{6}$

D. $2n\pi$

Answer: B::C::D

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20. The values of x_1 between 0 and 2π , satisfying the equation $\cos 3x + \cos 2x = \frac{\sin(3x)}{2} + \frac{\sin x}{2}$ are $\frac{\pi}{7}$ (b) $\frac{5\pi}{7}$ (c) $\frac{9\pi}{7}$ (d) $\frac{13\pi}{7}$

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

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

C. $\frac{9\pi}{7}$

D. $\frac{13\pi}{7}$

Answer: A::B::C::D

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21. Which of the following set of values of x satisfies the equation $2^{2\sin^{2x}+1} + 2^{2\sin^{2x}+3\sin x} = 9$? $x = n\pi \pm \frac{\pi}{6}, n \in I$ (b) $x = n\pi \pm \frac{\pi}{3}, n \in I$ $x = n\pi, n \in I$ (d) $x = 2n\pi + \frac{\pi}{2}, n \in I$

A. $x = n\pi \pm \frac{\pi}{6}, n \in I$

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

C. $x = n\pi, n \in I$

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

Answer: A::D

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22. If $0 < x < 2\pi$ and $|\cos x| \leq \sin x$, then

A. the set of all values of x is $\left[\frac{\pi}{4}, \frac{3\pi}{4}\right]$

B. the number of solutions that are integral multiple of $\frac{\pi}{2}$ is four

C. the sum of the largest and the smallest solution is π

D. the set of all values of x is $x \in \left[\frac{\pi}{4}, \frac{\pi}{2}\right) \cup \left(\frac{\pi}{2}, \frac{3\pi}{4}\right]$

Answer: A::C

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23. The expression $\cos 3\theta + \sin 3\theta + (2\sin 2\theta - 3)(\sin\theta - \cos\theta)$ is positive for all θ in

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

B. $\left(2n\pi - \frac{\pi}{4}, 2n\pi + \frac{\pi}{6}\right), n \in Z$

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

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

Answer: A::B

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24. The solutions of the equation $1+(\sin x-\cos x)\sin\frac{\pi}{4}=2\cos^2\frac{5x}{2}$ is/are

A. $x=\frac{n\pi}{3}+\frac{\pi}{8}, n\in Z$

B. $x=\frac{n\pi}{2}+\frac{5\pi}{16}, n\in Z$

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

D. $x=\frac{n\pi}{2}+\frac{7\pi}{8}, n\in Z$

Answer: A::B

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25. If $xandy$ are positive acute angles such that $(x+y)$ and $(x-y)$ satisfy the equation $\tan^2\theta-4\tan\theta+1=0,$ then $x=\frac{\pi}{6}$ (b) $x=\frac{\pi}{4}$

(c) $y = \frac{\pi}{6}$ (d) $y = \frac{\pi}{4}$

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

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

C. $y = \frac{\pi}{6}$

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

Answer: C::D

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26. The solutions of the system of equations $\sin x \sin y = \frac{\sqrt{3}}{4}, \cos x \cos y = \frac{\sqrt{3}}{4}$ are

A. $x = \frac{\pi}{3} + \frac{\pi}{2}(2n + k), n, k \in I$

B. $y = \frac{\pi}{6} + \frac{\pi}{2}(k - 2n), n, k \in I$

C. $x = \frac{\pi}{6} + \frac{\pi}{2}(2n + k), n, k \in I$

D. $y = \frac{\pi}{3} + \frac{\pi}{2}(k - 2n), n, k \in I$

Answer: A::B::C::D

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27. Let

$f(x) = \cos(a_1 + x) + \frac{1}{2}\cos(a_2 + x) + \frac{1}{2^2}\cos(a_1 + x) + + \frac{1}{2^{n-1}}\cos(a_n$

where $a)1, a_2 a_n \in R$. If $f(x_1) = f(x_2) = 0, then|x_2 - x_1|$ may be equal to π (b) 2π (c) 3π (d) $\frac{\pi}{2}$

A. π

B. 2π

C. 3π

D. $\pi / 2$

Answer: A::B::C

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28. The equation $2\sin^3\theta + (2\lambda - 3)\sin^2\theta - (3\lambda + 2)\sin\theta - 2\lambda = 0$ has exactly three roots in $(0, 2\pi)$, then λ can be equal to 0 (b) 2 (c) 1 (d) -1

A. 0

B. 2

C. 1

D. -1

Answer: A::C::D

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29. The system of equations $\tan x = a\cot x, \tan 2x = b\cos y$

A. cannot have a solution if $a = 0$

B. cannot have a solution if $a = 1$

C. cannot have a solution if $2\sqrt{a} > |b(1 - a)|$

D. has a solution for all a and b

Answer: B::C

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30. $\left(\cos^2 x + \frac{1}{\cos^2 x}\right)(1 + \tan^2 2y)(3 + \sin 3z) = 4,$ then y can take values equal to

A. x is an integral multiple of π

B. x cannot be an even multiple of π

C. z is an integral multiple of π

D. y is an integral multiple of $\pi/2$

Answer: A::D

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31. Number of real solution of the equation $(atnx + 1)(\tan x + 3)(\tan x + 5)(\tan x + 7) = 33$

A. will be two in the interval $[-\pi/2, \pi/2]$

B. will be four in the interval $[-\pi/2, \pi/2]$

C. will be three in the interval $[-\pi/2, \pi]$

D. will be four in the interval $[-\pi/2, \pi]$

Answer: A::D

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Exercise (Comprehension)

1. Consider the cubic equation

$x^3 - (1 + \cos\theta + \sin\theta)x^2 + (\cos\theta\sin\theta + \cos\theta + \sin\theta)x - \sin\theta\cos\theta = 0$

whose roots are x_1, x_2 and x_3.

The greatest possible difference between two of the roots if $\theta \in [0, 2\pi]$ is

A. 1

B. 2

C. $2\cos\theta$

D. $\sin\theta(\sin\theta+\cos\theta)$

Answer: B

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2. Consider the cubic equation

$x^3-(1+\cos\theta+\sin\theta)x^2+(\cos\theta\sin\theta+\cos\theta+\sin\theta)x-\sin\theta\cos\theta=0$

whose roots are x_1, x_2 and x_3.

The greatest possible difference between two of the roots if $\theta\in[0,2\pi]$ is

A. 3

B. 4

C. 5

D. 6

Answer: C

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3. Consider the cubic equation

$x^3 - (1 + \cos\theta + \sin\theta)x^2 + (\cos\theta\sin\theta + \cos\theta + \sin\theta)x - \sin\theta.\cos\theta = 0$

Whose roots are x_1, x_2 and x_3

A. 2

B. 1

C. $\sqrt{2}$

D. $2\sqrt{2}$

Answer: A

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4. Consider the equation

$\sec\theta + \cos ec\theta = a, \theta \in (0, 2\pi) - \{\pi/2, \pi, 3\pi/2\}$

If the equation has four distinct real roots, then

A. $|a| > 2\sqrt{2}$

B. $|a| < 2\sqrt{2}$

C. $a \geq -2\sqrt{2}$

D. none of these

Answer: A

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5. Consider the equation

$\sec\theta + \operatorname{cosec}\theta = a, \theta \in (0, 2\pi) - \{\pi/2, \pi, 3\pi/2\}$

If the equation has two distinct real roots, then

A. $|a| \geq 2\sqrt{2}$

B. $a < 2\sqrt{2}$

C. $|a| < 2\sqrt{2}$

D. none of these

Answer: C

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6. Consider the equation

$\sec\theta + \operatorname{cosec}\theta = a, \theta \in (0, 2\pi) - \{\pi/2, \pi, 3\pi/2\}$

If the equation has no real roots, then

A. $|a| \geq 2\sqrt{2}$

B. $a < 2\sqrt{2}$

C. $|a| < 2\sqrt{2}$

D. none of these

Answer: D

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7. Consider the system of equations

$\sin x \cos 2y = \left(a^2 - 1\right)^2 + 1, \cos x \sin 2y = a + 1$

The number of values of a for which the system has a solution is

A. 1

B. 2

C. 3

D. infinite

Answer: A

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8. Consider the system of equations

$\sin x \cos 2y = \left(a^2 - 1\right)^2 + 1, \cos x \sin 2y = a + 1$

The number of values of a for which the system has a solution is

A. 1

B. 2

C. 3

D. 4

Answer: B

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9. Consider the system of equations

$\sin x \cos 2y = \left(a^2 - 1\right)^2 + 1, \cos x \sin 2y = a + 1$

The number of values of a for which the system has a solution is

A. 2

B. 3

C. 4

D. 5

Answer: D

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10. Cosider the equation $\int_0^x (t^2 - 8t + 13)dt = x\sin(a/x)$

The number of real values of x for which the equation has solution is $A)1B)2C)3D)$ infinite

A. 1

B. 2

C. 3

D. infinite

Answer: A

Watch Video Solution

11. Consider the equation $\int_0^x (t^2 - 8t + 13)dt = x\sin(a/x)$

If x takes the values for which the equation has a solution, then the number of values of $a \in [0, 100]$ is

A. 2

B. 1

C. 5

D. 3

Answer: D

Watch Video Solution

12. Consider the equation $\int_0^x \left(t^2 - 8t + 13\right) dt = x \sin(a/x)$

If x takes the values for which the equation has a solution, then the number of values of $a \in [0, 100]$ is

A. $y \in [-5, 7]$

B. $y \in [-7, 5]$

C. $y \in [5, 7]$

D. none of these

Answer: B

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13. Consider the system of equations

$x\cos^3 y + 3x\cos y\sin^2 y = 14$

$x\sin^3 y + 3x\cos^2 y\sin y = 13$

The value of $\sin^2 y + 2\cos^2 y$ is.

A. $\pm 5\sqrt{5}$

B. $\pm\sqrt{5}$

C. $\pm 1/\sqrt{5}$

D. none of these

Answer: A

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14. Consider the system of equations

$x\cos^3 y + 3x\cos y\sin^2 y = 14$

$x\sin^3 y + 3x\cos^2 y\sin y = 13$

The number of values of $y \in [0, 6\pi]$ is

A. 5

B. 3

C. 4

D. 6

Answer: D

Watch Video Solution

15. Consider the system of equations

$x\cos^3 y + 3x\cos y\sin^2 y = 14$

$x\sin^3 y + 3x\cos^2 y\sin y = 13$

The value of $\sin^2 y + 2\cos^2 y$ is.

A. $4/5$

B. $9/5$

C. 2

D. none of these

Answer: B

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16. Let S_1 be the set of all those solution of the equation $(1+a)\cos\theta\cos(2\theta-b)=(1+a\cos 2\theta)\cos(\theta-b)$ which are independent of a and b and S_2 be the set of all such solutions which are dependent on a and b. Then

The set S_1 and S_2 are

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

B. $\left\{n\frac{\pi}{2}, n\in Z\right\}$ and $\{n\pi+(-1)^n\sin^{-1}(a\sin b), n\in Z\}$

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

D. none of these

Answer: A

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17. Let S_1 be the set of all those solution of the equation $(1+a)\cos\theta\cos(2\theta-b)=(1+a\cos 2\theta)\cos(\theta-b)$ which are independent of a and b and S_2 be the set of all such solutions which are dependent on a and b. Then

Condition that should be imposed on a and b such that S_2 in non empty is

A. a. $\left|\frac{a}{2}\sin b\right|<1$

B. b. $\left|\frac{a}{2}\sin b\right|\leq 1$

C. c. $|a\sin b|\leq 1$

D. d. none of these

Answer: C

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18. All the permissible value of b ,a=sin(2x-b)if $a = 0$ and $x = S_2$ is a subset of $(0, \pi)$ are given by

A. $b \in (-n\pi, 2n\pi), n \in Z$

B. $b \in (-n\pi, 2\pi - n\pi), n \in Z$

C. $b \in (-n\pi, n\pi), n \in Z$

D. none of these

Answer: B

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19. Let $\frac{b\cos x}{2\cos 2x - 1} = \frac{b + \sin x}{(\cos^2 x - 3\sin^2 x)\tan x}, b \in R.$

Equation has solutions if

A. $b \in \left(-\infty, \frac{1}{2}\right) - \left\{-1, 0, \frac{1}{3}\right\}$

B. $b \in (-\infty, 1) - \left\{-1, 0, \frac{1}{3}\right\}$

C. $b \in R - \left\{-1, 0, \frac{1}{3}\right\}$

D. none of these

Answer: A

Watch Video Solution

20. Let $\frac{b\cos x}{2\cos 2x - 1} = \frac{b + \sin x}{\left(\cos^2 x - 3\sin^2 x\right)\tan x}, b \in R.$

Equation has solutions if

A. a. Infinite

B. b. depends upon the value of b

C. c. four

D. d. none of these

Answer: C

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Exercises (Matrix Match Type)

1. Prove that $\frac{\sec A + \tan A}{\sec^2 A - \tan^2 A} = \sec A + \tan A$

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2. Consider three lines as follows. $L_1 : 5x - y + 4 = 0$ $L_2 : 3x - y + 5 = 0$ $L_3 : x + y + 8 = 0$ If these lines enclose a triangle ABC and the sum of the squares of the tangent to the interior angles can be expressed in the form $\frac{p}{q}$, where $pandq$ are relatively prime numbers, then the value of $p + q$ is (a) 500 (b) 450 (c) 230 (d) 465

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3. Evaluate $\int \frac{3^x}{\sqrt{1 - 9^x}} dx$

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4. Match the equation in List I with the number of solutions in List II.

A. $\begin{matrix} a & b & c & d \\ q & p & s & r \end{matrix}$

B. $\begin{matrix} a & b & c & d \\ q & p & r & s \end{matrix}$

C. $\begin{matrix} a & b & c & d \\ s & r & q & p \end{matrix}$

D. $\begin{matrix} a & b & c & d \\ p & q & r & s \end{matrix}$

Answer: A

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5. Consider the equation $\sin^2 x + (2a-3)\sin x + \left(a^2 - 3a + 2\right) = 0, x \in [0, 2\pi)$ and match the following lists.

A. $\begin{matrix} a & b & c & d \\ q & p & s & r \end{matrix}$

B. $\begin{matrix} a & b & c & d \\ q & p & r & s \end{matrix}$

C. $\begin{matrix} a & b & c & d \\ s & r & p & q \end{matrix}$

D. $\begin{matrix} a & b & c & d \\ p & q & r & s \end{matrix}$

Answer: C

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6. Draw the graph of $y = |x| + 2$

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Exercise (Numerical)

1. Number of values of p for which equation $\sin^3 x + 1 + p^3 - 3p \sin x = 0 (p > 0)$ has a root is _____

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2. If $\log_{0.5} \sin x = 1 - \log_{0.5} \cos x$, then the number of solutions of $x \in [-2\pi, 2\pi]$ is

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3. Number of roots of the equation $(3 + \cos x)^2 = 4 - 2\sin^8 x, x \in [0, 5\pi] are$ _____

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4. Number of solutions (s) of the equation $\frac{\sin x}{\cos 3x} + \frac{\sin 3x}{\cos 9x} + \frac{\sin 9x}{\cos 27x} = 0$ in the interval $\left(0, \frac{\pi}{4}\right)$ is _____.

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5. Number of solutions of the equation $\left(\sqrt{3}+1\right)^{2x} + \left(\sqrt{3}-1\right)^{2x} = 2^{3x}$ is_____

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6. Number of integral value(s) of m for which the equation $\sin x - \sqrt{3}\cos x = \frac{4m-6}{4-m}$ has solutions, $x \in [0, 2\pi]$, is _____

Watch Video Solution

7. 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_____

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8. If $\cos 4x = a_0 + a_1\cos^2 x + a^2\cos^4 x$ is true for all values of $x \in R$, then the value of $5a_0 + a_1 + a_2$ is_____

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9. Number of integral values of a for which the equation $\cos^2 x - \sin x + a = 0$ has roots when $x \in \left(0, \frac{\pi}{2}\right)$ is_____

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10. Number of roots of the equation $2^{\tan\left(x-\frac{\pi}{4}\right)} - 2(0.25)^{\sin\left(3\frac{\left(x-\frac{\pi}{4}\right)}{\cos 2x}\right)} + 1 = 0, is$ _ _ _

Watch Video Solution

11. The number of solution of $\sin^4 x - \cos^2 x \sin x + 2\sin^2 x + \sin x = 0$ in $0 \leq x \leq 3\pi$ is

Watch Video Solution

12. Let k be sum of all x in the interval $[0, 2\pi]$ such that $3\cot^2 x + 8\cot x + 3 = 0$, then the value of k/π is_____

Watch Video Solution

13. 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____

Watch Video Solution

14. If $2\tan^2 x - 5\sec x = 1$ is satisfied by exactly seven distinct values of $x \in \left[0, \frac{(2n+1)\pi}{2}\right], n \in N,$ then the greatest value of n is_____.

Watch Video Solution

15. If $\sin x + \sin y \geq \cos a \cos x, \forall x \in R$ then $\sin y + \cos a =$

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16. If $\sin(\sin x + \cos x) = \cos(\cos x - \sin x)$, and largest possible value of $\sin \xi s \frac{\pi}{k}$, then the value of k is_____.

View Text Solution

17. The number of solutions of the equation $1 + \cos x + \cos 2x + \sin x + \sin 2x + \sin 3x = 0$, which satisfy the condition $\frac{\pi}{2} < \left|3x - \frac{\pi}{2}\right| \leq \pi$ is

View Text Solution

18. the least value of 'a' for which the equation $2\sqrt{a}\sin^2 x + \sqrt{a-3}\sin 2x = 5 + \sqrt{a}$ has at least one solution is _____.

View Text Solution

19. The number of ordered pair (x, y) satisfying the equation $\sin^2(x+y)+\cos^2(x-y)=1$ which lie on the circle $x^2+y^2=\pi^2$ is _____.

Watch Video Solution

20. Total no. of orderd pairs (x,y) satisfying $x\left(\sin^2 x+\frac{1}{x^2}\right)=2\sin x, \sin^2 y,$ where $x \in (-\pi, 0)\cup(0,\pi)$ and $y \in [0, 2\pi]$ is/are

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21. Number of solutions of the equation $\cos 5x \times \tan(6|x|)+\sin 5x=0$ lying in $[-2\pi, \pi)$ is ____.

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JEE Main Previous Year

1. 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. 5

B. 7

C. 9

D. 3

Answer: B

Watch Video Solution

2. If the sum of all the solutions of the equation $8\cos x.\left(\cos\left(\frac{\pi}{6}+x\right)\cos\left(\frac{\pi}{6}-x\right)-\frac{1}{2}\right)=1$ in $[0,\pi]$ is $k\pi$ then k is equal to

A. $20/9$

B. $2/3$

C. $13/9$

D. $8/9$

Answer: C

Watch Video Solution

JEE Advanced Previous Year

1. If $\hat{a}$ and $\hat{b}$ are unit vectors inclined at an angle θ then prove that : $\tan\left(\frac{\theta}{2}\right) = \frac{|\hat{a}+\hat{b}|}{|\hat{a}-\hat{b}|}$

Watch Video Solution

2. 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

A. infinitely many solutions

B. three solutions

C. one solution

D. no solution

Answer: D

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3. Let $S = \left\{x\varepsilon(-\pi, \pi) : x \neq 0, +\frac{\pi}{2}\right\}$The sum of all distinct solutions of the equation $\sqrt{3}\sec x + \cos ecx + 2(\tan x - \cot x) = 0$ 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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4. For $0 < \theta < \frac{\pi}{2}$, the solutions of $\sigma_{m-1}^{6} \text{cosec}\left(\theta + \frac{(m-1)\pi}{4}\right) \text{ cosec } \left(\theta + \frac{m\pi}{4}\right) = 4\sqrt{2}$ is (are):

A. $\pi/4$

B. $\pi/6$

C. $\pi/12$

D. $5\pi/12$

Answer: C::D

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5. Let θ, ϕ ∈ [0, 2] be such that 2cosθ(1 - sinϕ) = sin2θ(tan2θ(tan(θ/2) + cot(θ/2))cosϕ - 1, tan(2π - θ) > 0 and - 1 < sinθ < - √3/2. Then ϕ cannot satisfy

A. $0 < \phi < \frac{\pi}{2}$

B. $\frac{\pi}{2} < \phi < \frac{4\pi}{3}$

C. $\frac{4\pi}{3} < \phi < \frac{3\pi}{2}$

D. $\frac{3\pi}{2} < \phi < 2\pi$

Answer: A::C::D

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6. Let f(x) = (1 - x)2sin2x + x2 for all x ∈ R, and let g(x) = ∫(2(t - 1)/(t + 1) - ln t)f(t)dt for t ∈ [1, x] for all x ∈ (1, ∞). Consider the statements: P: There exists some x ∈ R, such that f(x) + 2x = 2(1 + x2) Q: There exists some x ∈ R, such that 2f(x) + 1 = 2x(1 + x) (A) both P and Q are true (B) P is true and Q is false (C) P is false and Q is true (D) both P and Q are false.

A. both P and Q are true

B. P is true and Q is false

C. P is false and Q is true

D. both P and Q are false

Answer: C

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

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8. The number of values of θ in the interval $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ and $\theta \neq \frac{n\pi}{5}$ is where $n = 0, \pm 1, \pm 2$ and $\tan\theta = \cot(5\theta)$ and $\sin(2\theta) = \cos(4\theta)$ is

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9. 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

Watch Video Solution

10. Let $a,\ b,\ c$ be three non-zero real numbers such that the equation $\sqrt{3}\, a \cos x + 2\, b \sin x = c,\ x \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$, has two distinct real roots α and β with $\alpha + \beta = \frac{\pi}{3}$. Then, the value of $\frac{b}{a}$ is _____.

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Archives (Matrix Match Type)

1. Find the derivative of $y = \tan^{-1} 2x^3$

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SINGLE CORRECT ANSWER TYPE

1. The number of solutions of the equation $3^{2\sec^2 x} + 1 = 10.3^{\tan^2 x}$ in the interval $[0, 2\pi]$ is

A. 8

B. 6

C. 3

D. 2

Answer: C

Watch Video Solution

2. If the sum of the roots of the equation $\sin^2 \theta = k, (0 < k < 1)$ lying in $[0, 2\pi]$ is equal to the angles of a n-sided regular polygon, then the value

of n is

A. 6

B. 4

C. 2

D. none of these

Answer: A

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3. The number of distinct of real roots of the equation $\tan^2 2x + 2\tan 2x \tan 3x - 1 = 0$ in the interval $\left[0, \frac{\pi}{2}\right]$ is

A. 1

B. 2

C. 3

D. 4

Answer: C

Watch Video Solution

4. The number of solutions of equation $\cos 2x - 3\cos x + 1 = \frac{1}{(\cot 2x - \cot x).\sin(x - \pi)}$ in $[0, 4\pi]$ is

A. 0

B. 2

C. 4

D. 8

Answer: A

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5. The number of distinct real roots of the equation $\sqrt{\sin x} - \frac{1}{\sqrt{\sin x}} = \cos x (\text{where} 0 \leq x \leq 2\pi)$ is

A. 1

B. 2

C. 3

D. more than 3

Answer: B

Watch Video Solution

6. The number of distinct real roots of the equation $\sin^3 x + \sin^2 x \sin x - \sin x - \sin 2x - 2\cos x = 0$ belonging to the interval $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

A. 0

B. 1

C. 2

D. 3

Answer: B

Watch Video Solution

7. The number of solution of the equation $\sqrt{13 - 18\tan x} = 6\tan x - 3$, where $-2\pi < x < 2\pi$is

A. 0

B. 2

C. 4

D. 8

Answer: C

Watch Video Solution

8. The number of solutions of equation $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+\sin\theta & 1 \\ 1 & 1 & 1+\cot\theta \end{vmatrix} = 0$ in $\theta \in [0, 2\pi]$ is equal to

A. 2

B. 3

C. 4

D. 5

Answer: A

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9. The number of solution of the equation $|\cos x| = \cos x - 2\sin x \text{in}[0, 6\pi]$ is

A. 3

B. 5

C. 7

D. 9

Answer: C

Watch Video Solution

10. The number of solutions of the equation $\log_5 \tan\theta = \log_5 4.\ \log_4(3\sin\theta) \text{in}[0,\ 8\pi]$ is

A. 0

B. 2

C. 4

D. none of these

Answer: C

Watch Video Solution

11. If $\log_{10}(\sin x) + \log_{10}(\tan y) + \log_{10} 2 = 0$ and $\cot y = 2\sqrt{3}\cos x$, then ordered pair (x, y) satisfying the equations simultaneously is(are)

(A) $\left(\frac{\pi}{3}, \frac{\pi}{3}\right)$ (B) $\left(\frac{\pi}{3}, \frac{\pi}{6}\right)$ (C) $\left(\frac{\pi}{6}, \frac{2\pi}{3}\right)$ (D) $\left(\frac{\pi}{3}, \frac{7\pi}{6}\right)$

A. 0

B. 2

C. 4

D. 8

Answer: C

Watch Video Solution

12. Find the general solution of the equation $3^{\sin 2x + 2\cos^2 x} + 3^{1 - \sin 2x + 2\sin^2 x} = 28$

A. 3

B. 4

C. 5

D. 6

Answer: B

Watch Video Solution

13. If the equation $a\sin^3 x + (b-s)\sin^2 x + (c-b)\sin x = c = 0$ has exactly three distinct solutions in $[0, \pi]$, where a + b + c = 0, then which of the following is not the possible value of c/a ?

A. 1

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

C. $\frac{\sqrt{2}}{7}$

D. $\frac{2}{7}$

Answer: A

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14. The number of roots of the equation $\sin\left(2x+\frac{\pi}{18}\right)\cos\left(2x-\frac{\pi}{9}\right)=-\frac{1}{4}$ in $[0, 2\pi]$ is

A. 2

B. 4

C. 6

D. 8

Answer: B

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15. The number of solution satisfying the equations $\tan 4\theta = \cot 5\theta$ and $\sin 2\theta = \cos\theta$ in $[0, 2\pi]$ is

A. 2

B. 3

C. 4

D. 1

Answer: C

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16. If n_1 denotes the maximum number of roots of $\sin\theta = k_1$ in $[0, 2\pi]$ and n_2 denotes the maximum number of roots of $\cos\theta = k_2$ in $[0, 2\pi]$, then Option A: $n_1 + n_2 = 5$ Option B: $n_1 + n_2 = 4$ Option C: $n_1 + n_2 = 6$ Option D: $n_1 + n_2 = 3$

A. $n_1 + n_2 = 5$

B. $n_1 + n_2 = 4$

C. $n_1 + n_2 = 6$

D. $n_1 + n_2 = 3$

Answer: A

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17. $\frac{\sin 3\theta}{2\cos 2\theta + 1} = \frac{1}{2}$ if $(n \in Z)$

A. $\theta = 2n\pi + \frac{\pi}{6}$

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

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

D. $\theta - n\pi - \frac{\pi}{6}$

Answer: C

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18. The general solution of the equation $\frac{1 - \sin x + ... + (-1)^n \sin^n x + ...}{1 + \sin x + ... + \sin^n x + ...} = \frac{1 - \cos 2x}{1 + \cos 2x}$ is

A. $(-1)^n(\pi/6) + n\pi$

B. $(-1)^n(\pi/3) + n\pi$

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

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

Answer: A

Watch Video Solution

19. The general solution of the equation, $2\cot.\frac{\theta}{2}=(1+\cot\theta)^2$ is $(n\in Z)$

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

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

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

D. none of these

Answer: B

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20. If $\cos 2\theta = (\sqrt{2}+1)\left(\cos\theta - \frac{1}{\sqrt{2}}\right)$, then the general value of $\theta(n \in Z)$

A. $2n\pi \pm \frac{\pi}{6}$

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

C. $n\pi + \frac{7\pi}{36}$

D. none of these

Answer: D

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21. The number of solutions of the equation $16\left(\sin^5 x + \cos^5 x\right) = 11(\sin x + \cos x)$ in the interval $[0, 2\pi]$ is

A. 6

B. 7

C. 8

D. 9

Answer: A

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22. The sum of solutions of $\sin \pi x + \cos \pi x = 0$ in $[0, 100]$ is

A. 4375

B. 4975

C. 5000

D. 5025

Answer: D

Watch Video Solution

23. If the equation $(4\cos^2 x - 2\sin x - 3)$ sin x, then x is equal to $(n \in Z)$

A. $n\pi + \left(\frac{3\pi}{10}\right)$

B. $n\pi + (-1)^{n+1}\left(\frac{3\pi}{10}\right)$

C. $n\pi + \left(\frac{3\pi}{10}\right)$

D. none of these

Answer: B

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24. The number of solutions of the equation $\cos^2\left(\frac{\pi}{3}\cos x - \frac{8\pi}{3}\right) = 1$ in the interval $[0, 10\pi]$ is

A. 1

B. 3

C. 5

D. 7

Answer: C

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25. If $\alpha < \beta < \gamma$ and $\sin\gamma\cos\alpha = 1$, where $\alpha, \gamma \in [\pi, 2\pi]$, then the least integral value of $f(x) = |x - \alpha| + |x - \beta| + |x - \gamma|$ is

A. 0

B. 1

C. 2

D. 3

Answer: C

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26. solve the equation for x, $5^{\frac{1}{2}} + 5^{\frac{1}{2}+\log_5 \sin x} = 15^{\frac{1}{2}+\log_{15} \cos x}$

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27. Given x + sin y = 2009 and x + 2009 cos y = 2008, where $y \in \left[0, \frac{\pi}{2}\right]$, then [x+y] equals, where [.] represents the greatest integer function,

A. 2008

B. 2009

C. 2100

D. 2010

Answer: B

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28. The number of solutions of equation $\sin. \frac{5x}{2} - \sin. \frac{x}{2} = 2$ in $[0, 2\pi]$ is

A. 0

B. 1

C. 2

D. 3

Answer: A

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29. Find the general solution of the trignometric equation $3^{\frac{1}{2}+\log_3(\cos x+\sin x)}-2^{\log_2(\cos x-\sin x)}=\sqrt{2}$

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

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

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

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

Answer: A

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30. If the equation $k\sin x + \sqrt{k-2}\cos x + (\tan\alpha + \cot\alpha) = 0, 0 < \alpha < \frac{\pi}{2},$ possesses real solution, then k belongs to

A. $(-\infty, -3] \cup [2, \infty)$

B. $[-3, 2]$

C. $[0, 2)$

D. R

Answer: A

Watch Video Solution

31. If the equation $x^2 + 12 + 3\sin(a + bx) + 6x = 0$ has atleast one real solution, where $a, b \in [0, 2\pi]$, then the value of a - 3b is $(n \in Z)$

A. $2n\pi$

B. $(2n+1)\pi$

C. $(4n-1)\frac{\pi}{2}$

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

Answer: C

Watch Video Solution

32. The number of solutions of the equation $\sin x.\sin 2x.\sin 3x = 1$ in $[0, 2\pi]$ is

A. 0

B. 1

C. 2

D. 3

Answer: A

Watch Video Solution

33. The solution set of the system of equations $x+y=\frac{2\pi}{3}, \cos x+\cos y=\frac{3}{2},$ where $xandy$ are real, is _____

A. $n\pi+(-1)^n\sin^{-1}\frac{3}{2}+\frac{\pi}{6}$

B. $2n\pi\pm\cos^{-1}\frac{3}{2}-\frac{\pi}{6}$

C. no solution

D. none of these

Answer: C

Watch Video Solution

34. The number of distinct real roots of the equation $\sin\pi x=x^2-x+\frac{5}{4}$ is

A. 0

B. 1

C. 2

D. 4

Answer: B

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35. The number of ordered 5-tuple (u, v, w, x, y) where $(u, v, w, x, y \in [1, 11])$ which satisfy the inequality $2^{\sin^2 u + 3\cos^2 v} . 3^{\sin^2 w + \cos^2 x} . 5^{\cos^2 y} \geq 720$ is

A. 216

B. 246

C. 432

D. 432

Answer: C

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36. The values of a for which the equation $\sqrt{a}\sin x - 2\cos x = \sqrt{2} + \sqrt{2-a}$ has solutions are

A. $p > 0$

B. $p \leq 3$

C. $1 \leq p \leq 2$

D. $\sqrt{5} - 1 \leq p \leq 2$

Answer: D

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37. If $|\cos ecx| = \frac{5\pi}{4} + \frac{x}{2} \forall x \in (-2\pi, 2\pi)$, then the number of solutions are

A. 8

B. 6

C. 4

D. 2

Answer: A

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38. The number of solution of the equation $|\sin x| = |\cos 3x|$ in $[-2\pi, 2\pi]$ is

A. 32

B. 28

C. 24

D. 30

Answer: C

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39. If $6|\sin x| = x$ when $x \in [0, 2\pi]$, then the number of solutions are

A. 0

B. 3

C. 5

D. 4

Answer: D

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40. The number of solutions of equations $|\tan 2x| = \sin x \quad \text{in}[0, \pi]$

A. 2

B. 4

C. 6

D. 8

Answer: B

Watch Video Solution

41. The number of distnct real roots of the equation $x = \left(\frac{5\pi}{2}\right)^{\cos x}$

A. 0

B. 1

C. 2

D. 3

Answer: D

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42. If $\frac{\sin 3\theta}{\cos 2\theta} < 0$, then θ lies in

A. $\left((3\pi), (8), \frac{23\pi}{48}\right)$

B. $\left(\frac{7\pi}{24}, \frac{3\pi}{8}\right)$

C. $\left(\frac{13\pi}{48}, \frac{7\pi}{24}\right)$

D. $\left(\frac{2\pi}{4}, \frac{7\pi}{12}\right)$

Answer: C

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43. If $2\sin^2\left(x - \frac{\pi}{3}\right) - 5\sin\left(x - \frac{\pi}{3}\right) + 2 < 0$, then belongs tp

A. $\left(\frac{(12n-5)\pi}{6}, \frac{(4n+1)\pi}{2}\right), n \in Z$

B. $\left(\frac{(6n-7)\pi}{6}, \frac{(2n+1)\pi}{2}\right), n \in Z$

C. $\left(\frac{(4n+1)\pi}{6}, n\pi\right), n \in Z$

D. $\left((4n+1)\frac{\pi}{2}, (12n+7)\frac{\pi}{6}\right), n \in Z$

Answer: D

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44. If equation $x^2 + 2x + 2 + e^{\alpha} - 2\sin\beta = 0$ has a real solution in x, then (where $n \in \mathbb{Z}$)

A. $\alpha, \beta \in R$

B. $\alpha \in (0, 1), \beta \in (\pi/6, \pi/2)$

C. $\alpha \in (0, 1), \beta \in (2n\pi + \pi/6, 2n\pi + 5\pi/6)$

D. $\alpha \in (-\infty, 0], \beta \in (2n\pi - \pi/6)$

Answer: C

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Subjective Type

1. Solve : If $\frac{1}{\cos\theta} + \frac{1}{\cos 3\theta} = \frac{1}{\cos 5\theta}$

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2. Solve : $3 - 2\cos\theta - 4\sin\theta - \cos 2\theta + \sin 2\theta = 0.$

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3. The most general solution of $2^{\sin x} + 2^{\cos x} = 2^{1 - \frac{1}{\sqrt{2}}}$ is $(n \in Z)$

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4. Solve : $\cos 3x.\cos^3 x + \sin 3x.\sin^3 x = 0$

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5. Find all the solution of $4cas^2 x \sin x - 2\sin^2 x = 3\sin x$

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6. Solve : $1 + 2\cos ecx = -\frac{\sec^2\frac{x}{2}}{2}$

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7. Solve : $2\sin\left(3x+\frac{\pi}{4}\right)=\sqrt{1+8\sin 2x.\cos^2 2x}, x\in(0,2\pi)$

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8. Solve the following system of equations for x and y $5^{\cos ec^2 x-3\sec^2 y}=1$ and $2^{2\cos ecx+\sqrt{3}|\sec y|}=64$

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9. Solve : $2+\tan x.\cot.\frac{x}{2}+\cot x.\tan.\frac{x}{2}=0.$

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Multiple Correct Answers Type

1. If $\alpha \in [-2\pi, 2\pi]$ and $\cos.\frac{\alpha}{2} + \sin.\frac{\alpha}{2} = \sqrt{2}(\cos 36^\circ - \sin 18^\circ)$, then a value of α

A. $\frac{7\pi}{6}$

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

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

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

Answer: A::D

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2. If $\sin\left(\frac{6}{5}x\right) = 0$ and $\cos\left(\frac{x}{5}\right) = 0$, then

A. $x = (n-5)\pi$

B. $x = 6(n-1)\pi$

C. $x = 5\left(n - \frac{1}{2}\right)\pi$

D. $x = 5\left(n + \frac{1}{2}\right)\pi$

Answer: C::D

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3. The equation $x^3 = \frac{3}{4}x = -\frac{\sqrt{3}}{8}$ is satisfied by $x = \cos\left(\frac{5\pi}{18}\right)$ (b) $x = \cos\left(\frac{7\pi}{18}\right)$ $x = \cos\left(\frac{23\pi}{18}\right)$ (d) $x = \cos\left(\frac{17\pi}{18}\right)$

A. $x = \cos\left(\frac{5\pi}{18}\right)$

B. $x = \cos\left(\frac{7\pi}{18}\right)$

C. $x = \cos\left(\frac{23\pi}{18}\right)$

D. $x = -\sin\left(\frac{7\pi}{9}\right)$

Answer: A::B

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4. If 5 sin x cos y = 1, 4 tan x = tan y, then

A. $x = (m+n)\frac{\pi}{2} + \frac{\pi}{4} + (-1)^m \frac{1}{2}\sin^{-1}\left(-\frac{3}{5}\right), m, n \in Z$

B. $y = (n-m)\frac{\pi}{2} + \frac{\pi}{4} + (-1)^{m+1} \frac{1}{2}\sin^{-1}\left(-\frac{3}{5}\right), m, n \in Z$

C. $x = (m+n)\frac{\pi}{2} + \frac{\pi}{4} + (-1)^m \frac{1}{2}\sin^{-1}\left(\frac{3}{5}\right), m, n \in Z$

D. $y = (n-m)\frac{\pi}{2} + \frac{\pi}{4} + (-1)^{m+1} \frac{1}{2}\sin^{-1}\left(\frac{3}{5}\right), m, n \in Z$

Answer: A::B

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5. Which of the following are the solutons of equations $2\sin 11x + \cos 3x + \sqrt{3}\sin 3x = 0$?

A. $x = \frac{n\pi}{7} - \frac{\pi}{84}, n \in Z$

B. $x = \frac{n\pi}{4} + \frac{7\pi}{48}, n \in Z$

C. $x = \frac{n\pi}{7} - \frac{\pi}{63}, n \in Z$

D. $x = \frac{n\pi}{4} + \frac{\pi}{24}, n \in Z$

Answer: A::B

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6. The function $f(x) = \sqrt{3}\sin x - \cos x$ will increase monotically in the interval(s)

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

B. $-\frac{\pi}{3} \leq x \leq \frac{2\pi}{3}$

C. $\frac{5\pi}{3} \leq x \leq \frac{8\pi}{3}$

D. $0 \leq x \leq \pi$

Answer: B::C

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7. If $\cos 3\theta + \sin 3\theta + (2\sin 2\theta - 3)(\sin\theta - \cos\theta) > 0$, then θ lies in

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

B. $\left(2n\pi - \frac{\pi}{2}, 2n\pi + \frac{\pi}{6}\right), n \in Z$

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

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

Answer: A::B

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