



MATHS

BOOKS - DEEPTI MATHS (TELUGU ENGLISH)

TRIGONOMETRIC EQUATIONS

Solved Examples

1. If $\log_{\cos x} \sin x + \log_{\sin x} \cos x = 2$ then $x =$

A. π

B. $\pi/3$

C. $\pi/4$

D. $\pi/6$

Answer: C



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2. If $\sin^{10} x - \cos^{10} x = 1$ then $x =$

A. $n\pi$

B. $2n\pi + \pi/2$

C. $(2n + 1)\pi/2$

D. $n\pi/2$

Answer: A



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3. If $\tan \theta \tan(120^\circ - \theta) \tan(120^\circ + \theta) = 1/\sqrt{3}$, then $\theta =$

A. $\frac{n\pi}{3} - \frac{\pi}{12}, n \in Z$

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

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

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

Answer: D



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4. $\cos 2x + a \sin x = 2a - 7$ has a solution if

A. $a = 0$

B. $1 \leq a \leq 2$

C. $2 \leq a \leq 6$

D. $6 \leq a \leq 8$

Answer: C



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Exercise 1

1. If $\cos \theta = \cos 5\pi/4$, then $\theta =$

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

B. $2n\pi \pm \frac{3\pi}{4}$

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

D. $2n\pi \pm \frac{7\pi}{4}$

Answer: B



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2. The values of θ satisfying $\cos ec\theta + 2 = 0$ in $(0, 2\pi)$ are

A. $210^\circ, 300^\circ$

B. $240^\circ, 300^\circ$

C. $210^\circ, 240^\circ$

D. $210^\circ, 330^\circ$

Answer: D

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3. The solution set of $\sqrt{3} \cos \theta = \sin \theta$ is

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

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

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

D. $\left\{ n\pi + \frac{\pi}{6} : n \in Z \right\}$

Answer: A

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4. The solution set of $4 \sin^2 \theta = 3$ is

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

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

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

D. $\{n\pi \pm n \in \mathbb{Z}\}$

Answer: A



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5. Solution of $7 \sin^2 x + 3 \cos^2 x = 4$ is

A. $n\pi \pm \pi/2$

B. $n\pi \pm \pi/4$

C. $n\pi \pm \pi/3$

D. $n\pi \pm \pi/6$

Answer: D

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6. The solution set of $\sec \theta = 2 \cos \theta$ is

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

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

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

D. $\{ n\pi \pm n \in \mathbb{Z} \}$

Answer: B

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7. The solution set of $\tan \theta = 3 \cot \theta$ is

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

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

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

D. $\{ n\pi \pm n \in \mathbb{Z} \}$

Answer: A



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8. The general solution of $\tan^2 \theta = 3$ is

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

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

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

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

Answer: C

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9. The solution set of $\cos 2\theta = \cos^2 \theta$ is

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

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

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

D. $\{ n\pi : n \in \mathbb{Z} \}$

Answer: D

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10. The solution set of $\cos 2\theta = 2 \sin^2 \theta$ is

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

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

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

D. $\{ n\pi : n \in \mathbb{Z} \}$

Answer: C

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11. The most general value of θ satisfying both the equations $\sin \theta = 1/2$, $\tan \theta = 1/\sqrt{3}$ is

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

B. $2n\pi - \frac{7\pi}{6}$

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

D. none

Answer: A



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12. The solution set of $\cot \theta = -\sqrt{3}$, $\cos ec \theta = 2$ is

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

B. $\left\{ 2n\pi + \frac{3\pi}{4} : n \in \mathbb{Z} \right\}$

C. $\left\{ 2n\pi + \frac{7\pi}{6} : n \in \mathbb{Z} \right\}$

D. $\left\{ 2n\pi + \frac{5\pi}{6} : n \in \mathbb{Z} \right\}$

Answer: D



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13. The most general value of θ satisfies both the equations

$$\tan \theta = -1 \text{ and } \cos \theta = \frac{1}{\sqrt{2}} \text{ is}$$

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

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

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

D. $\frac{7n\pi}{4}$

Answer: B

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14. The solution set of $\sin 2\theta = -1/\sqrt{2}$ is

A. $\left\{ \frac{n\pi}{2} + (-1)^{n+1} \frac{\pi}{6} : n \in \mathbb{Z} \right\}$

B. $\left\{ \frac{n\pi}{2} + (-1)^n \frac{\pi}{12} : n \in \mathbb{Z} \right\}$

C. $\left\{ \frac{n\pi}{3} + (-1)^n \frac{2\pi}{15} : n \in \mathbb{Z} \right\}$

D. $\left\{ \frac{n\pi}{2} + (-1)^{n+1} \frac{\pi}{8} : n \in \mathbb{Z} \right\}$

Answer: D

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15. The solution set of $4 \sin \theta \cos \theta = 1$ is

A. $\left\{ \frac{n\pi}{2} + (-1)^{n+1} \frac{\pi}{6} : n \in \mathbb{Z} \right\}$

B. $\left\{ \frac{n\pi}{2} + (-1)^n \frac{\pi}{12} : n \in \mathbb{Z} \right\}$

C. $\left\{ \frac{n\pi}{3} + (-1)^n \frac{2\pi}{15} : n \in \mathbb{Z} \right\}$

D. $\left\{ \frac{n\pi}{2} + (-1)^{n+1} \frac{\pi}{8} : n \in \mathbb{Z} \right\}$

Answer: B

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16. The solution set of $\sin 3\theta = \frac{\sqrt{10 + 2\sqrt{5}}}{4}$ is

A. $\left\{ \frac{n\pi}{2} + (-1)^{n+1} \frac{\pi}{6} : n \in \mathbb{Z} \right\}$

$$B. \left\{ \frac{n\pi}{2} + (-1)^n \frac{\pi}{12} : n \in \mathbb{Z} \right\}$$

$$C. \left\{ \frac{n\pi}{3} + (-1)^n \frac{2\pi}{15} : n \in \mathbb{Z} \right\}$$

$$D. \left\{ \frac{n\pi}{2} + (-1)^{n+1} \frac{\pi}{8} : n \in \mathbb{Z} \right\}$$

Answer: C

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17. The solution set of $\cos 3\theta = \frac{\sqrt{5} + 1}{4}$ is

$$A. \left\{ (12n \pm 1) \frac{2\pi}{15} : n \in \mathbb{Z} \right\}$$

$$B. \left\{ (10n \pm 1) \frac{\pi}{15} : n \in \mathbb{Z} \right\}$$

$$C. n\pi + (-1)^n \frac{3\pi}{15}$$

$$D. n\pi + (-1)^n \frac{\pi}{15}$$

Answer: B

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18. The solution set of $\cos 2\theta = \frac{\sqrt{3} - 1}{2\sqrt{2}}$ is

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

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

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

D. $\left\{ n\pi \pm \frac{5\pi}{24} : n \in \mathbb{Z} \right\}$

Answer: D

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19. The solution set of $\sec \theta = 2 \cos \theta$ is

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

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

C. $\left\{ \frac{n\pi}{6} : n \in \mathbb{Z} \right\}$

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

Answer: D



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20. If x is an acute angle and

$$\sin(x + 28^\circ) = \cos(3x - 78^\circ), \text{ then } x =$$

A. 248° or 112°

B. 35° or 8°

C. 46° or 7°

D. 265° or 119°

Answer: B



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21. The general solution of $2 \sin^2 \theta - \sin \theta - 1 = 0$ 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. $n\pi - (-1)^n \frac{\pi}{6}$

Answer: D



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22. If $\sin^{10} x - \cos^{10} x = 1$ then $x =$

A. $n\pi$

B. $2n\pi + \pi/2$

C. $(2n + 1)\pi/2$

D. $n\pi/2$

Answer: C



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23. The number of roots of the equation

$$2\sin^2 \theta + 3\sin \theta + 1 = 0 \text{ in } (0, 2\pi) \text{ is}$$

A. 1

B. 2

C. 3

D. 4

Answer: C

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

A. $\frac{\sqrt{5} + 1}{2}$

B. $\frac{\sqrt{5} + 1}{8}$

C. $\frac{\sqrt{5} - 1}{8}$

D. $\frac{\sqrt{5} - 1}{2}$

Answer: D

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25. If $2 \sin x + \cos ecx = 3$ then $\theta =$

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

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

C. $n\pi + (-1)^{n+1} \frac{\pi}{6} : n \in Z$ or $n\pi + (-1)^n \frac{\pi}{3} : n \in Z$

D. $n\pi + (-1)^n \frac{\pi}{2} : n \in Z$ or $n\pi + (-1)^n \frac{\pi}{6} : n \in Z$

Answer: D

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26. If $\cos^2 \theta - \sin \theta = 1/4$ then $\theta =$

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

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

C. $n\pi + (-1)^{n+1} \frac{\pi}{6} : n \in Z$ or $n\pi + (-1)^n \frac{\pi}{3} : n \in Z$

D. $n\pi + (-1)^n \frac{\pi}{2} : n \in Z$ or $n\pi + (-1)^n \frac{\pi}{6} : n \in Z$

Answer: B

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27. If $4 \cos \theta - \sec \theta = 4 \tan \theta$ then $\theta =$

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

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

C. $n\pi + (-1)^{n+1} \frac{\pi}{6} : n \in \mathbb{Z}$ or $n\pi + (-1)^n \frac{\pi}{3} : n \in \mathbb{Z}$

D. $n\pi + (-1)^n \frac{\pi}{2} : n \in \mathbb{Z}$ or $n\pi + (-1)^n \frac{\pi}{6} : n \in \mathbb{Z}$

Answer: B



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28. If $3 \cos 2\theta + 2 = 7 \sin \theta$ then $\theta =$

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

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

C. $n\pi + (-1)^{n+1} \frac{\pi}{6} : n \in \mathbb{Z}$ or $n\pi + (-1)^n \frac{\pi}{3} : n \in \mathbb{Z}$

D. $n\pi + (-1)^n \frac{\pi}{2} : n \in \mathbb{Z}$ or $n\pi + (-1)^n \frac{\pi}{6} : n \in \mathbb{Z}$

Answer: B

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29. $\{x \in \mathbb{R} : \cos 2x + 2 \cos^2 x - 2 = 0\} =$

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

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

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

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

Answer: B

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30. If $4 \sin^2 x - 2(1 + \sqrt{3}) \sin x + \sqrt{3} = 0$ then $\theta =$

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

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

C. $n\pi + (-1)^{n+1} \frac{\pi}{6} : n \in \mathbb{Z}$ or $n\pi + (-1)^n \frac{\pi}{3} : n \in \mathbb{Z}$

D. $n\pi + (-1)^n \frac{\pi}{2} : n \in \mathbb{Z}$ or $n\pi + (-1)^n \frac{\pi}{6} : n \in \mathbb{Z}$

Answer: D

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31. If $\cos ec^2 \theta - 3 \cos ec \theta + 2 = 0$ then $\theta =$

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

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

C. $n\pi + (-1)^{n+1} \frac{\pi}{6} : n \in \mathbb{Z}$ or $n\pi + (-1)^n \frac{\pi}{3} : n \in \mathbb{Z}$

D. $n\pi + (-1)^n \frac{\pi}{2} : n \in \mathbb{Z}$ or $n\pi + (-1)^n \frac{\pi}{6} : n \in \mathbb{Z}$

Answer: D

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32. If $4 \cos^2 x \sin x - 2 \sin^2 x = 3 \sin x$, then $x =$

A. $n\pi + (-1)^n \pi / 10$

B. $n\pi - (-1)^n \pi / 10$

C. $2n\pi \pm \pi / 10$

D. $n\pi + \pi/10$

Answer: A

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33. If $r \sin \theta = \sqrt{3}$, $r + 4 \sin \theta = 2(\sqrt{3} + 1)$, $0 \leq \theta \leq 2\pi$,

then $\theta =$

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

B. $\frac{\pi}{6}, \frac{\pi}{3}, \frac{5\pi}{6}, \frac{2\pi}{3}$

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

D. none of these

Answer: B

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

- A. $24/25$
- B. $-24/25$
- C. $13/18$
- D. $-13/18$

Answer: B

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

A. $\left\{ \frac{\pi}{3}, \frac{2\pi}{3} \right\}$

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

C. $\left\{ \frac{2\pi}{3}, \frac{4\pi}{3} \right\}$

D. $\left\{ \frac{2\pi}{3}, \frac{5\pi}{3} \right\}$

Answer: C

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36. If $\sin^2 x - \cos x = 1/4$ then the values of x in $(0, 2\pi)$ are

A. $\pi/3, 5\pi/3$

B. $\pi/3, -\pi/3$

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

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

Answer: A



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37. If $2 \cos^2 \theta + \cos \theta - 1 = 0$ then $\theta =$

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

B. $2n\pi \pm \frac{\pi}{3} : n \in Z$ or $2n\pi \pm \frac{5\pi}{6} : n \in Z$

C. $(2n + 1)\pi : n \in Z$ or $2n\pi \pm \frac{\pi}{3} : n \in Z$

D. $2n\pi : n \in \mathbb{Z}$ or $2n\pi \frac{\pi}{3} : n \in \mathbb{Z}$

Answer: C

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38. If $2 \sin^2 \theta = 3 \cos \theta$, then the value of θ in $[0, 2\pi]$ are

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

B. $\pi/3, 5\pi/3$

C. $2\pi/3, 5\pi/3$

D. none

Answer: B

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39. The general solution of $\sin^2 x - 2 \cos x + \frac{1}{4} = 0$ is

A. $2n\pi \pm \pi/2$

B. $n\pi \pm \pi/2$

C. $2n\pi \pm \pi/3$

D. none

Answer: C



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40.

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

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

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

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

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

Answer: D



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41. If $2 \sin \theta + \tan \theta = 3 \sin \theta \cdot \cos \theta$ then $\theta =$

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

B. $2n\pi \pm \frac{\pi}{3} : n \in \mathbb{Z}$ or $2n\pi \pm \frac{5\pi}{6} : n \in \mathbb{Z}$

C. $2n\pi : n \in \mathbb{Z}$

D. No solution

Answer: C

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42. If $2 + \sqrt{3} \sec x - 4 \cos x = 2\sqrt{3}$ then $\theta =$

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

B. $2n\pi \pm \frac{\pi}{3} : n \in Z$ or $2n\pi \pm \frac{5\pi}{6} : n \in Z$

C. $(2n + 1)\pi : n \in Z$ or $2n\pi \pm \frac{\pi}{3} : n \in Z$

D. $2n\pi : n \in Z$ or $2n\pi \pm \frac{\pi}{3} : n \in Z$

Answer: B

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43. If $2 \sin^2 x + \sqrt{3} \cos x + 1 = 0$, then $\theta =$

A. $n\pi \pm 5\pi/6$

B. $2n\pi \pm 5\pi/6$

C. $n\pi \pm 3\pi/4$

D. $2n\pi \pm 3\pi/4$

Answer: B



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44. If $6 \sec^2 \theta - 5 \sec \theta + 1 = 0$ then $\theta =$

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

B. $2n\pi \pm \frac{\pi}{3} : n \in \mathbb{Z}$ or $2n\pi \pm \frac{5\pi}{6} : n \in \mathbb{Z}$

C. $n\pi : n \in \mathbb{Z}$ or $2n\pi \pm 109^\circ 32' : n \in \mathbb{Z}$

D. No solution

Answer: D

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45. $\frac{\cos 3\theta}{2 \cos 2\theta - 1} = \frac{1}{2}$ if

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

B. $\theta = 2n\pi \pm \frac{\pi}{3}$

C. $\theta = 2n\pi \pm \frac{\pi}{6} (n \in \mathbb{I})$

D. $\theta = n\pi + \frac{\pi}{6} (n \in \mathbb{I})$

Answer: B



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46. If $\cot \theta - \tan \theta = \sec \theta$, then $\theta =$

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

B. $n\pi + \pi / 2$

C. $2n\pi + 3\pi / 2$

D. none

Answer: A



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47. If $\tan^2 \theta + \tan \theta - 2 = 0$ then $\theta =$

A. $\frac{n\pi}{3} + \frac{\pi}{9} : n \in \mathbb{Z}$

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

C. $n\pi + (-1)^n \frac{\pi}{6} : n \in \mathbb{Z}$

D. $n\pi + \frac{\pi}{4} : n \in \mathbb{Z}$

Answer: D

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48. The solution set of $\tan^2 \theta - (1 + \sqrt{3})\tan \theta + \sqrt{3} = 0$

is

A. $\left\{n\pi + \frac{\pi}{3} : n \in \mathbb{Z}\right\} \cup \left\{n\pi + \frac{\pi}{4} : n \in \mathbb{Z}\right\}$

$$B. \left\{ n\pi + \frac{\pi}{4} : n \in \mathbb{Z} \right\} \cup \left\{ n\pi + \frac{\pi}{6} : n \in \mathbb{Z} \right\}$$

$$C. \left\{ n\pi + \frac{\pi}{6} : n \in \mathbb{Z} \right\}$$

$$D. \left\{ n\pi + \frac{5\pi}{24} : n \in \mathbb{Z} \right\}$$

Answer: A

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49. If $(\tan \theta - 1)(\tan^2 \theta - 3) = 0$ then $\theta =$

$$A. n\pi + \frac{\pi}{12} : n \in \mathbb{Z} \text{ or } n\pi + \frac{5\pi}{12} : n \in \mathbb{Z}$$

$$B. n\pi + \frac{\pi}{4} : n \in \mathbb{Z} \text{ or } n\pi \pm \frac{\pi}{3} : n \in \mathbb{Z}$$

$$C. n\pi + (-1)^n \frac{\pi}{6} : n \in \mathbb{Z}$$

$$D. n\pi + \frac{\pi}{3} : n \in \mathbb{Z} \text{ or } n\pi - \frac{\pi}{6} : n \in \mathbb{Z}$$

Answer: B

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50. If $3tna^4\theta - 10\tan^2\theta + 3 = 0$ then $\theta =$

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

B. $n\pi \pm \frac{\pi}{6} : n \in Z$ or $n\pi \pm \frac{\pi}{3} : n \in Z$

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

D. $2n\pi + \frac{\pi}{4} : n \in Z$ or $2n\pi : n \in Z$

Answer: B

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51. If $\tan \theta + \tan 2\theta + \tan \theta \tan 2\theta = 1$ then $\theta =$

A. $\frac{n\pi}{3} + \frac{\pi}{9} : n \in \mathbb{Z}$

B. $\frac{n\pi}{3} + \frac{\pi}{12} : n \in \mathbb{Z}$

C. $n\pi + (-1)^n \frac{\pi}{6} : n \in \mathbb{Z}$

D. $n\pi + \frac{\pi}{4} : n \in \mathbb{Z}$

Answer: B

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52. If $\tan \theta + \tan 2\theta + \sqrt{3} \tan \theta \tan 2\theta = \sqrt{3}$ then $\theta =$

A. $\frac{n\pi}{3} + \frac{\pi}{9} : n \in \mathbb{Z}$

B. $\frac{n\pi}{3} + \frac{\pi}{12} : n \in \mathbb{Z}$

C. $n\pi + (-1)^n \frac{\pi}{6} : n \in \mathbb{Z}$

D. $n\pi + \frac{\pi}{4} : n \in \mathbb{Z}$

Answer: A



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53. If $\tan x + \tan 4x + \tan 7x = \tan x \tan 4x \tan 7x$, then

$x =$

A. $n\pi / 3$

B. $n\pi / 4$

C. $n\pi / 6$

D. $n\pi / 12$

Answer: D

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54. If $3 \tan(\theta - 15^\circ) = \tan(\theta + 15^\circ)$, $0 < \theta < \pi$ then

$\theta =$

A. $\pi / 2$

B. $\pi / 4$

C. $\pi / 6$

D. $\pi / 3$

Answer: B

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55. The smallest value of ' θ ' satisfying the equation

$$\sqrt{3}(\cot \theta + \tan \theta) = 4 \text{ is}$$

A. $2\pi / 3$

B. $\pi / 3$

C. $\pi / 6$

D. $\pi / 12$

Answer: C



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56. If a is any real number, the number of roots of $\cot x - \tan$

$x = a$ in the first quadrant is

A. 2

B. 0

C. 1

D. none of these

Answer: C



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57. If $\sin A = \sin B$ and $\cos A = \cos B$ then $A =$

A. $2n\pi + B$

B. $2n\pi - B$

C. $n\pi + B$

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

Answer: A

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58. For what values of x in the first quadrant $\frac{2 \tan x}{1 - \tan^2 x}$ is positive ?

A. $x \in (0, \pi/4)$

B. $x \in (0, \pi/2)$

C. $\pi/2, \pi/6$

D. No solution

Answer: A



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

A. \emptyset

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

C. $\{n\pi + \pi/4 : n \in \mathbb{Z}\}$

D. $\{2n\pi + \pi/4 : n \in \mathbb{Z}\}$

Answer: B



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60. If $\tan \alpha = m / (m + 1)$, $\tan \beta = 1 / (2m + 1)$, then $\alpha + \beta =$

A. $n\pi + \pi / 2$

B. $n\pi + \pi / 3$

C. $n\pi - \pi / 4$

D. $n\pi + \pi / 4$

Answer: D

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61. If $\tan(\pi / 4 + \theta) + \tan(\pi / 4 - \theta) = 4$, then $\theta =$

A. $n\pi + \pi / 6$

B. $n\pi \pm \pi/6$

C. $n\pi \pm \pi/4$

D. none

Answer: B



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62. If $\tan^2 x + \cot^2 x = 2$, then $x =$

A. $n\pi + \pi/4$

B. $n\pi - \pi/4$

C. $n\pi \pm \pi/4$

D. $2n\pi + \pi/4$

Answer: C



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63. The general solution of $\tan^4 \theta + \cot^4 \theta = 0$ is

A. 1

B. 2

C. no solution

D. none

Answer: C



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64. If $\cot \theta - \tan \theta = 2$, then $\theta =$

A. $(4n + 1)\pi / 8$

B. $(4n - 1)\pi / 8$

C. $(3n + 1)\pi / 6$

D. $(3n - 1)\pi / 7$

Answer: A



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65. If $8 \sin^2 \theta + 10 \sin \theta \cos \theta - 3 \cos^2 \theta = 0$ then $\theta =$

A. $n\pi + \frac{\pi}{3} : n \in \mathbb{Z}$

B. $n\pi + \tan^{-1}(1/2) : n \in \mathbb{Z}$ or $n\pi + \frac{\pi}{4} : n \in \mathbb{Z}$

$$C. n\pi + (-1)^n \frac{\pi}{6} : n \in \mathbb{Z}$$

$$D. n\pi - \tan^{-1}(3/2) : n \in \mathbb{Z}$$

or

$$n\pi + \tan^{-1}(1/4) : n \in \mathbb{Z}$$

Answer: D

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66. If $3 \cos^2 \theta - 2\sqrt{3} \sin \theta \cos \theta - 3 \sin^2 \theta = 0$, then $\theta =$

A. $n\pi + \pi/6$ or $n\pi - \pi/3$

B. $n\pi \pm 6$ or $n\pi + \pi/3$

C. $n\pi \pm \pi/3$

D. none of these

Answer: A

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67. If $\sin^3 x + \sin x \cdot \cos x + \cos^3 x = 1$ then $x =$

A. $2n\pi \pm \frac{\pi}{2} : n \in Z$ or $2n\pi : n \in Z$

B. $n\pi \pm \frac{\pi}{6} : n \in Z$ or $n\pi \pm \frac{\pi}{3} : n \in Z$

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

D. $2n\pi + \frac{\pi}{4} : n \in Z$ or $2n\pi : n \in Z$

Answer: A

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68. If $2 - \cos^2 \theta = 3 \sin \theta \cos \theta$ then $\theta =$

A. $n\pi + \frac{\pi}{3} : n \in \mathbb{Z}$

B. $n\pi + \tan^{-1}(1/2) : n \in \mathbb{Z}$ or $n\pi + \frac{\pi}{4} : n \in \mathbb{Z}$

C. $n\pi + (-1)^n \frac{\pi}{6} : n \in \mathbb{Z}$

D. $n\pi - \tan^{-1}(3/2) : n \in \mathbb{Z}$

or

$n\pi + \tan^{-1}(1/4) : n \in \mathbb{Z}$

Answer: B

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69. If $1 + \sin^2 \theta = 3 \sin \theta \cos \theta$, then $\theta =$

A. $n\pi + \pi/4, n\pi + \tan^{-1}(1/2)$

B. $n\pi - \pi/4, n\pi - \tan^{-1}(1/2)$

C. $n\pi + \pi/2, n\pi - \cot^{-1}(1/2)$

D. $n\pi + \pi/2, n\pi + \cot^{-1}(1/2)$

Answer: A

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70. If $\tan^2 \theta = 3 \sec^2 \theta - 1$ then $\theta =$

A. $n\pi + \frac{\pi}{3} : n \in \mathbb{Z}$

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

C. $n\pi + (-1)^n \frac{\pi}{6} : n \in \mathbb{Z}$

D. $n\pi - \frac{\pi}{3} : n \in \mathbb{Z}$

Answer: A



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71. If $\cos m\theta = \sin n\theta$, then $\theta =$

A. $\frac{k\pi + \pi/2}{m \pm n}$

B. $\frac{k\pi + \pi/3}{m \pm n}$

C. $\frac{2k\pi + \pi/2}{m \pm n}$

D. none

Answer: C



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72. If $\cos \theta + \sqrt{3} \sin \theta = 2$ then $\theta =$

A. $\pi / 3$

B. $2\pi / 3$

C. $4\pi / 3$

D. $5\pi / 3$

Answer: A

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73. The equation $\sqrt{3} \sin x + \cos x = 4$ has

A. Only one solution

B. Two solutions

C. Infinitely many solutions

D. No solution

Answer: D



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74. If $\sqrt{3} \cos \theta - \sin \theta = 1$ then $\theta =$

A. π

B. $\pi/2$

C. $\pi/3$

D. $\pi/6$

Answer: D

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75. If $\sqrt{3} \cos \theta + \sin \theta = \sqrt{2}$, then $\theta =$

A. $n\pi + (-1)^n \pi/4 + \pi/6$

B. $2n\pi \pm \pi/4 + \pi/6$

C. $n\pi + \pi/6$

D. $2n\pi \pm \pi/6$

Answer: B

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76. The set of solutions of the equation

$$(\sqrt{3} - 1)\sin \theta + (\sqrt{3} + 1)\cos \theta = 2 \text{ is :}$$

A. $\left\{ 2n\pi \pm \frac{\pi}{4} + \frac{\pi}{12} : n \in \mathbb{Z} \right\}$

B. $\left\{ 2n\pi \pm \frac{\pi}{4} - \frac{\pi}{12} : n \in \mathbb{Z} \right\}$

C. $\left\{ n\pi(-1)^n \frac{\pi}{4} + \frac{\pi}{12} : n \in \mathbb{Z} \right\}$

D. $\left\{ n\pi + (-1)^n \frac{\pi}{4} - \frac{\pi}{12} : n \in \mathbb{Z} \right\}$

Answer: D



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77. If $\sec x - \cos ecx = 2\sqrt{2}$ then $\theta =$

A. $2n\pi - \frac{\pi}{4} : n \in \mathbb{Z}$ or $\frac{2n\pi}{3} - \frac{\pi}{4} : n \in \mathbb{Z}$

B. $2n\pi + \frac{\pi}{2} : n \in \mathbb{Z}$ or $2n\pi - \frac{\pi}{3} : n \in \mathbb{Z}$

C. $2n\pi + \frac{\pi}{4} : n \in \mathbb{Z}$

D. $2n\pi + \frac{\pi}{12} : n \in \mathbb{Z}$ or $2n\pi + \frac{5\pi}{12} : n \in \mathbb{Z}$

Answer: A

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78. If $(2 + \sqrt{3})\cos x + \sin x = 1$ then $\theta =$

A. $2n\pi - \frac{\pi}{4} : n \in \mathbb{Z}$ or $\frac{2n\pi}{3} - \frac{\pi}{4} : n \in \mathbb{Z}$

B. $2n\pi + \frac{\pi}{2} : n \in \mathbb{Z}$ or $2n\pi - \frac{\pi}{3} : n \in \mathbb{Z}$

C. $2n\pi + \frac{\pi}{4} : n \in \mathbb{Z}$

D. $2n\pi + \frac{\pi}{12} : n \in \mathbb{Z}$ or $2n\pi + \frac{5\pi}{12} : n \in \mathbb{Z}$

Answer: B

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79. If $3 \sin x + 4 \cos x = 5$ then $x =$

A. $2n\pi - \frac{\pi}{4} : n \in Z$ or $\frac{2n\pi}{3} - \frac{\pi}{4} : n \in Z$

B. $2n\pi + \frac{\pi}{2} : n \in Z$ or $2n\pi - \frac{\pi}{3} : n \in Z$

C. $2n\pi + \tan^{-1} \frac{3}{4} : n \in Z$

D. $2n\pi + \frac{\pi}{12} : n \in Z$ or $2n\pi + \frac{5\pi}{12} : n \in Z$

Answer: C

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80. If $\cot \theta + \operatorname{cosec} \theta = \sqrt{3}$ then $\theta =$

A. $2n\pi + \pi/6$

B. $2n\pi + \pi/3$

C. $2n\pi - \pi/6$

D. none of these

Answer: B

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81. If $\operatorname{cosec} x = 1 + \cot x$, then $x =$

A. $n\pi + \pi/2$

B. $n\pi - \pi/2$

C. $2n\pi + \pi/2$

D. $2n\pi - \pi/2$

Answer: C



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82. All the values of x satisfying $\sin 2x + \sin 4x = 2 \sin 3x$ are

A. $n\pi/3$

B. $2n\pi$

C. $n\pi$

D. $n\pi + \pi/3$

Answer: A

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83. If $3 \cos x \neq 2 \sin x$, then the general solution of

$\sin^2 x - \cos 2x = 2 - \sin 2x$ is $x =$

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

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

C. $(4n \pm 1) \frac{\pi}{2}, n \in Z$

D. $(2n - 1)\pi, n \in Z$

Answer: C

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84. If $2 \sin 2x - \sin x = 0$, then $x =$

A. $n\pi$

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

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

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

Answer: A



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85. If $\sqrt{1 - \cos x} = \sin x$ then $x =$

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

B. $2n\pi + \pi/4, n \in Z$ are $n\pi, n \in Z$

C. $n\pi, n \in \mathbb{Z}$ are $(2n + 1)\pi/4, n \in \mathbb{Z}$

D. none

Answer: A



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86. The values of ' θ ' satisfying $\sin 7\theta = \sin 4\theta - \sin \theta$ in $0 < \theta < \pi/2$ are

A. $\pi/9, \pi/4$

B. $\pi/3, \pi/9$

C. $\pi/6, \pi/4$

D. $\pi/3, \pi/4$

Answer: A

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87. If $\sin 7\theta + \sin 4\theta + \sin \theta = 0$, $0 \leq \theta \leq \pi/2$, then $\theta =$

A. $0, \frac{\pi}{2}, \pi, \frac{3\pi}{5}$

B. $0, \frac{\pi}{3}, \pi, \frac{2\pi}{3}$

C. $0, \frac{\pi}{4}, \frac{\pi}{2}, \frac{2\pi}{9}$

D. $1, \frac{\pi}{2}, \pi, \frac{2\pi}{9}$

Answer: C

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88. If $\sin 6\theta = \sin 4\theta - \sin 2\theta$, then $\theta =$

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

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

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

D. $(2n + 1)\frac{\pi}{3}$

Answer: B

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89. The values of θ satisfying $\sin 5\theta = \sin 3\theta - \sin \theta$ and

$0 < \theta < \frac{\pi}{2}$ are

A. $\pi/6, \pi/3$

B. $\pi/6, \pi/4$

C. $\pi/4, \pi/3$

D. $\pi/4, \pi/2$

Answer: A

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90. If $\cos \theta + \cos 2\theta + \cos 3\theta = 0$ then $\theta =$

A. $(2n + 1)\frac{\pi}{4} : n \in Z$ or $2n\pi \pm \frac{2\pi}{3} : n \in Z$

B. $\frac{n\pi}{4} : n \in Z$ or $n\pi \pm \frac{\pi}{6} : n \in Z$

C. $n\pi : n \in Z$ or $(2n + 1)\frac{\pi}{9} : n \in Z$

D. $(2n + 1)\frac{\pi}{10} : n \in Z$ or $\frac{2n\pi}{3} \pm \frac{\pi}{9} : n \in Z$

Answer: A



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91. If $\cos 2\theta + \cos 8\theta = \cos 5\theta$ then $\theta =$

A. $(2n + 1)\frac{\pi}{4} : n \in Z$ or $2n\pi \pm \frac{2\pi}{3} : n \in Z$

B. $\frac{n\pi}{4} : n \in Z$ or $n\pi \pm \frac{\pi}{6} : n \in Z$

C. $n\pi : n \in Z$ or $(2n + 1)\frac{\pi}{9} : n \in Z$

D. $(2n + 1)\frac{\pi}{10} : n \in Z$ or $\frac{2n\pi}{3} \pm \frac{\pi}{9} : n \in Z$

Answer: D



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92. If $\cos 6\theta + \cos 4\theta + \cos 2\theta + 1 = 0$ for $0 \leq \theta \leq \pi$ then

$\theta =$

A. $\frac{\pi}{7}, \frac{5\pi}{7}, \pi$

B. $\frac{\pi}{2}, \frac{\pi}{4}, \frac{3\pi}{4}, \frac{\pi}{6}, \frac{5\pi}{6}$

C. $\frac{\pi}{8}, \frac{3\pi}{8}, \frac{5\pi}{8}, \frac{7\pi}{8}, \frac{\pi}{3}, \frac{2\pi}{3}$

D. $\frac{2n\pi}{3} : n \in Z$ or $n\pi + \frac{\pi}{4} : n \in Z$

Answer: B



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93. If $\sec x \cos 5x + 1 = 0$, $0 < x < 2\pi$, then $x =$

A. $(n - 1)\pi/3$ or $(2n - 1)\pi/4$

B. $(n + 1)\pi / 3$ or $(2n + 1)\pi / 4$

C. $(2n - 1)\pi / 5$ or $(2n + 1)\pi / 4$

D. $(2n + 1)\pi / 6$ or $(2n + 1)\pi / 4$

Answer: D

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94. If $\cos \theta \cos 2\theta \cos 3\theta = 1/4$ for $0 < \theta < \pi$ then $\theta =$

A. $\frac{\pi}{7}, \frac{5\pi}{7}, \pi$

B. $\frac{\pi}{2}, \frac{\pi}{4}, \frac{3\pi}{4}, \frac{\pi}{6}, \frac{5\pi}{6}$

C. $\frac{\pi}{8}, \frac{3\pi}{8}, \frac{5\pi}{8}, \frac{7\pi}{8}, \frac{\pi}{3}, \frac{2\pi}{3}$

D. $\frac{2n\pi}{3} : n \in Z$ or $n\pi + \frac{\pi}{4} : n \in Z$

Answer: C

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95. If $4 \sin x \cdot \sin 2x \cdot \sin 4x = \sin 3x$ then $\theta =$

A. $n\pi$ or $(3n \pm 1)\frac{\pi}{9} : n \in Z$

B. $\frac{n\pi}{3} + (-1)^n \frac{\pi}{6} : n \in Z$

C. $\frac{2n\pi}{3} \pm \frac{\pi}{9} : n \in Z$

D. $\frac{n\pi}{3} + \frac{\pi}{18} : n \in Z$

Answer: A

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96. If $4 \cos \theta \cdot \cos(120^\circ + \theta) \cdot \cos(120^\circ - \theta) = 1/2$ then $\theta =$

A. $n\pi$ or $(3n \pm 1)\frac{\pi}{9} : n \in \mathbb{Z}$

B. $\frac{n\pi}{3} + (-1)^n \frac{\pi}{6} : n \in \mathbb{Z}$

C. $\frac{2n\pi}{3} \pm \frac{\pi}{9} : n \in \mathbb{Z}$

D. $\frac{n\pi}{3} + \frac{\pi}{18} : n \in \mathbb{Z}$

Answer: C

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97. The sum of the solutions in $(0, 2\pi)$ of the equation \cos

$$x \cos\left(\frac{\pi}{3} - x\right) \cos\left(\frac{\pi}{3} + x\right) = \frac{1}{4}$$
 is

A. π

B. 2π

C. 3π

D. 4π

Answer: D



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98. If $\sin \theta \cdot \sin(60 + \theta) \sin(60 - \theta) = 1/4$ then $\theta =$

A. $n\pi$ or $(3n \pm 1) \frac{\pi}{9} : n \in Z$

B. $\frac{n\pi}{3} + (-1)^n \frac{\pi}{6} : n \in Z$

C. $\frac{2n\pi}{3} \pm \frac{\pi}{9} : n \in Z$

D. $\frac{n\pi}{3} + \frac{\pi}{18} \cdot n \in \mathbb{Z}$

Answer: B

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99. If $\sin 3\alpha = 4 \sin \alpha \sin(x + \alpha) \sin(x - \alpha)$, then $x =$

A. $n\pi \pm \pi/3$

B. $2n\pi \pm \pi/3$

C. $n\pi \pm \pi/6$

D. $2n\pi \pm \pi/6$

Answer: A

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100. If $\tan \theta + \tan(60^\circ + \theta) + \tan(120^\circ + \theta) = 3$, then $\theta =$

A. $(4n + 1) \frac{\pi}{12}$

B. $(2n + 1)\pi / 12$

C. $n\pi + \pi / 3$

D. none

Answer: A



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101. If $\tan \theta + \tan 2\theta + \tan 3\theta = 0$ then $\theta =$

A. $\frac{n\pi}{3} : n \in \mathbb{Z}$ or $n\pi \pm \tan^{-1}(1/\sqrt{2}) : n \in \mathbb{Z}$

B. $\frac{n\pi}{3} + (-1)^n \frac{\pi}{6} : n \in \mathbb{Z}$

C. $\frac{2n\pi}{3} \pm \frac{\pi}{9} : n \in \mathbb{Z}$

D. $(4n + 1) \frac{\pi}{12} : n \in \mathbb{Z}$

Answer: A



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102. If $\tan \theta + \tan 2\theta = \tan 3\theta$, then $\theta =$

A. $n\pi, n\pi \pm \pi/3$

B. $n\pi/3, n\pi/4$

C. $n\pi/3, n\pi/4$

D. $n\pi/3, n\pi/5$

Answer: B

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103. If $\tan \theta + \tan(\pi/3 + \theta) - \tan(\pi/3 - \theta) = 3$ then

$\theta =$

A. $\frac{n\pi}{3} : n \in Z$ or $n\pi \pm \tan^{-1}(1/\sqrt{2}) : n \in Z$

B. $\frac{n\pi}{3} + (-1)^n \frac{\pi}{6} : n \in Z$

C. $\frac{2n\pi}{3} \pm \frac{\pi}{9} : n \in Z$

D. $(4n + 1) \frac{\pi}{12} : n \in Z$

Answer: D



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104. The solution of $\sin 2\theta + \cos 2\theta + \sin \theta + \cos \theta + 1 = 0$ in the first quadrant is

A. $2n\pi + \frac{2\pi}{3} : n \in Z$ or $(2n - 1)\pi + \frac{\pi}{6} : n \in Z$

B. $(2n + 1)\frac{\pi}{2} : n \in Z$ or $n\pi - \frac{\pi}{4} : n \in Z$

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

D. No solution

Answer: D



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105.

If

$$\cos 3x + \cos 2x = \sin(3x/2) + \sin(x/2), 0 \leq x \leq 2\pi,$$

then $x =$

A. $\frac{\pi}{7}, \frac{5\pi}{7}, \pi, \frac{9\pi}{7}, \frac{13\pi}{7}$

B. $\frac{\pi}{6}, \frac{5\pi}{6}, \pi, \frac{7\pi}{6}, \frac{13\pi}{6}$

C. $\frac{\pi}{5}, \frac{2\pi}{5}, \pi, \frac{9\pi}{5}, \frac{13\pi}{5}$

D. none of these

Answer: A



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106. The solution set of $\sin 2\theta - \cos 2\theta - \sin \theta + \cos \theta = 0$ is

A. $2n\pi : n \in \mathbb{Z}$ or $\frac{2n\pi}{3} - \frac{\pi}{6} : n \in \mathbb{Z}$

B. $2n\pi\frac{\pi}{3} : n \in \mathbb{Z}$ or $\frac{2n\pi}{3} - \frac{\pi}{6} : n \in \mathbb{Z}$

C. $2n\pi : n \in \mathbb{Z}$ or $\frac{n\pi}{3} - \frac{\pi}{6} : n \in \mathbb{Z}$

D. $2n\pi\frac{\pi}{3} : n \in \mathbb{Z}$ or $\frac{n\pi}{3} - \frac{\pi}{6} : n \in \mathbb{Z}$

Answer: A



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107.

if

$\sin x - 3 \sin 2x + \sin 3x = \cos x - 3 \cos 2x + \cos 3x$ then

x =

A. $n\pi + \pi/8$

B. $n\pi/2 + \pi/8$

C. $(-1)^2 n\pi/2 + \pi/8$

D. $2n\pi + \cos^{-1} 3/2$

Answer: B



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108. If $\sin\left[\frac{\pi}{4}\cot\theta\right] = \cos\left[\frac{\pi}{4}\tan\theta\right]$ then $\theta =$

A. $n\pi + \pi/2$

B. $n\pi + \pi/4$

C. $n\pi - \pi/4$

D. $n\pi + \pi/3$

Answer: B

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109. If $\tan\left(\frac{\pi}{2}\sin\theta\right) = \cot\left(\frac{\pi}{2}\cos\theta\right)$ then $\sin\left(\theta + \frac{\pi}{4}\right) =$

A. $\pm 1/2$

B. $\pm 1/\sqrt{2}$

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

D. 2

Answer: B



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110. If $\tan(\pi \cos \theta) = \cot(\pi \sin \theta)$, then prove that

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

A. $\pm 1/2$

B. $\pm 1/\sqrt{2}$

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

D. 2

Answer: C



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111. If $\tan(\cot x) = \cot(\tan x)$, then $\sin 2x =$

A. $(2n + 1)\pi / 4$

B. $4 / (2n + 1)\pi$

C. $4\pi / (2n + 1)$

D. none

Answer: B



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112.

If

$$1 + \sin x + \sin^2 x + \dots \infty = 4 + 2\sqrt{3}, 0 < x < \pi, x \neq \pi/2$$

then $x =$

A. $\pi/6, \pi/3$

B. $\pi/3, 5\pi/6$

C. $2\pi/3, \pi/6$

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

Answer: D



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113. The expression $(1 + \tan x + \tan^2 x)(1 - \cot x + \cot^2 x)$ 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 $x \in \mathcal{R}$

D. $x \geq 0$

Answer: C



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114. The solutions of the system of equations $x + y = 2\pi/3$ and $\cos x + \cos y = 3/2$ where x and y are real, are

A. $x = \pi, y = -\pi/3$

B. $x = -\pi/3, y = \pi$

C. \emptyset

D. none of these

Answer: C



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115. If $x + y = 2\pi/3$ and $\cos x + \cos y = \sqrt{3}/2$, then $x, y =$

A. $\pi/3, \pi/6$

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

C. $\pi/2, \pi/6$

D. No solution

Answer: C



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116. The smallest positive real value of p for which the equation $\cos (p \sin x) = \sin (p \cos x)$ has a solution where $x \in [0, 2\pi]$ is

A. $\frac{\pi\sqrt{2}}{4}$

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

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

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

Answer: A



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117. The smallest positive values of x and y which satisfy

$$\tan(x - y) = 1, \sec(x + y) = 2/\sqrt{3} \text{ are}$$

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

B. $x = \frac{7\pi}{24}, y = \frac{37\pi}{24}$

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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118. The solution of $(81)^{\sin^2 x} + (81)^{\cos^2 x} = 30$ in $[0, \pi/2]$ is

A. $\pi/6, \pi/3$

B. $\pi/3, \pi/2$

C. $\pi, \pi/2$

D. none

Answer: A



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119. The general solution x for the equation

$$9^{\cos x} - 2 \cdot 3^{\cos x} + 1 = 0 \text{ is}$$

A. $n\pi$

B. $n\pi/2$

C. $2n\pi$

D. $(2n + 1)\pi/2$

Answer: D



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120. The equation $e^{\sin x} - e^{-\sin x} - 4 = 0$ has

- A. exactly one real root
- B. exactly four real roots
- C. infinite number of real roots
- D. no real roots

Answer: D



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121. 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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122. The equation $\cos^4 x - (a + 2)\cos^2 x - (a + 3) = 0$ possesses a solution if

A. $a > -3$

B. $a < -2$

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

D. a is any positive integer

Answer: C

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123. If $\frac{1}{6} \sin x, \cos x, \tan x$ are in G.P. then x is equal to

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

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

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

D. none of these

Answer: B



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124. The minimum value of $2^{\sin x} + 2^{\cos x}$ is

A. 1

B. 2

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

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

Answer: D



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125. If $\tan px = \cot qx$ then the solutions are in

- A. G.P.
- B. A.P.
- C. H.P.
- D. none

Answer: B

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126. If $x \in (-\pi, \pi)$ such that
 $y = 1 + |\cos x| + |\cos^2 x| + |\cos^3 x| + \dots$ And $8^y = 64$,
then $y =$

A. 1

B. 2

C. 3

D. 4

Answer: B



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127. The value of x which satisfies

$$8^{1 + |\cos x| + |\cos x|^2 + \dots} = 64 \text{ in } [-\pi, \pi] \text{ is}$$

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

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

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

D. $\pm \frac{\pi}{6}, \pm \frac{\pi}{3}$

Answer: B



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128. If the equation $(\cos p - 1)x^2 + \cos px + \sin p = 0$ in the variable x has real roots then p can taken any value in the interval

A. $(0, 2\pi)$

B. $(-\pi, 0)$

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

D. $(0, \pi)$

Answer: D



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129. In a triangle ABC , $\angle A > \angle B$. If the measures of $\angle A, \angle B$ satisfy the equation $3 \sin x - 4 \sin^3 x - k = 0, 0 < k < 1$ then the measure of $\angle C$ is

A. $\pi / 3$

B. $\pi / 2$

C. $2\pi / 3$

D. $5\pi / 6$

Answer: C



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130. If α, β are different values of x satisfying

$$a \cos x + b \sin x = c \text{ then } \tan \left(\frac{\alpha + \beta}{2} \right) =$$

A. $a + b$

B. $a - b$

C. a/b

D. b/a

Answer: D



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131. If α, β are solutions of $a \cos x + b \sin x = c$ then

$$\cos \alpha + \cos \beta =$$

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

B. $\frac{2ac}{a^2 + b^2}$

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

D. $\frac{b}{a}$

Answer: B

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132. If α, β are solutions of $a \cos x + b \sin x = c$ then

$$\sin \alpha + \sin \beta =$$

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

B. $\frac{2bc}{a^2 + b^2}$

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

D. $\frac{b}{a}$

Answer: B



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133. If α, β are the solutions of $a \cos 2\theta + b \sin 2\theta = c$, then

$\tan \alpha \tan \beta =$

A. $\frac{c + a}{c - a}$

B. $\frac{2b}{c + b}$

C. $\frac{c - a}{c + a}$

D. none

Answer: C

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134. If α, β are different values of θ satisfying the equation

$5 \cos \theta + 12 \sin \theta = 11$ then the value of $\sin(\alpha + \beta) =$

A. $119/120$

B. $5/12$

C. $120/169$

D. $12/5$

Answer: C

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135. If α, β are solutions of $a \tan \theta + b \sec \theta = c$ then $\tan(\alpha + \beta) =$

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

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

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

D. none

Answer: A

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1. I : Principal value of $\cos \theta = -1$ is π

II : Principal value of $\sin \theta = 0$ is π

A. only I is true

B. only II is true

C. both I and II are true

D. neither I or II are true

Answer: A

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2. I : The solution of $7\sin^2 x + 3\cos^2 x = 4$ is

$\{n\pi \pm \pi/6 : n \in \mathbb{Z}\}$

II : The solution of $\tan^2 \theta = 3$ is $\{n\pi \pm \pi/3 : n \in \mathbb{Z}\}$

- A. only I is true
- B. only II is true
- C. both I and II are true
- D. neither I or II are true

Answer: C



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3. I : The solution of the simultaneous equations

$$\sin \theta = 1/2, \tan \theta = 1/\sqrt{3} \text{ is } \{2n\pi + \pi/6 : n \in \mathbb{Z}\}$$

II : The solution of the simultaneous equations

$$\cos \theta = -1/\sqrt{2}, \tan \theta = -1 \text{ is } \{2n\pi + 3\pi/4 : n \in \mathbb{Z}\}$$

A. only I is true

B. only II is true

C. both I and II are true

D. neither I or II are true

Answer: C

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4. I : If $\sin\left(\frac{\pi}{4}\cot\theta\right) = \cos\left(\frac{\pi}{4}\tan\theta\right)$ then

$$\theta = n\pi + \pi/4, n \in \mathbb{Z}$$

II : If $\tan\left(\frac{\pi}{2}\sin\theta\right) = \cot\left(\frac{\pi}{2}\cos\theta\right)$ then

$$\sin\left(\theta + \frac{\pi}{4}\right) = \pm \frac{1}{\sqrt{2}}$$

A. only I is true

B. only II is true

C. both I and II are true

D. neither I or II are true

Answer: C



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Exercise 2 Special Type Questions Set 2

1. Ascending order of number of solutions in the given interval of the following equations.

(A) $\sin x = -1$ in $(0, 4\pi)$

(B) $\cos x = -1/2$ in $(0, 4\pi)$

(C) $\tan x = -1$ in $(0, 6\pi)$

(D) $\tan x = 1$ in $(0, \pi/2)$

A. D,A,C,B

B. D,A,B,C

C. A,B,D,C

D. A,B,C,D

Answer: B



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2. If p_1, p_2, p_3 are the principal values of following trigonometric equations

$$\text{I) } \sin \theta = -1/2 \quad \text{II) } \cos \theta = -\frac{\sqrt{3}}{2}$$

$$\text{III) } \tan \theta = \sqrt{3} - 2$$

A. $p_1 < p_2 < p_3$

B. $p_1 < p_3 < p_2$

C. $p_3 < p_1 < p_2$

D. $p_2 < p_3 < p_1$

Answer: B



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3. Arrange the following equations in decreasing order of their number of solutions in $[0, 2\pi]$

(A) $3 \sin^2 \theta + 4 \cos^2 \theta = 5$

$$(B) 4 \sin^2 \theta + 3 \cos^2 = 7/2$$

$$(C) = 3 \sin^2 \theta + 4 \cos^2 \theta = 4$$

A. B, C, A

B. A, B, C

C. C, A, B

D. C, B, A

Answer: A



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4. If $0 \leq \theta \leq \pi$, $\cos 6\theta + \cos 4\theta + \cos 2\theta + 1 = 0$ then the ascending order of the values of θ is

A. $\pi/6, \pi/4, \pi/2, 3\pi/4, 5\pi/6$

B. $\pi/6, \pi/4, \pi/3, \pi/2, 3\pi/2$

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

D. $\pi/3, \pi/2, 3\pi/4, 2\pi/3, 5\pi/6$

Answer: A



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Exercise 2 Special Type Questions Set 3

1. For $0 \leq x \leq 2\pi$, match the following

Trigonometric equation	Number of solutions
------------------------	---------------------

<i>I.</i> $\tan^2 x + \cot^2 x = 2$	(a) 2
-------------------------------------	-------

<i>II.</i> $\sin^2 x - \cos x = 1/4$	(b) 0
--------------------------------------	-------

<i>III.</i> $4\sin^2 \theta + 6\cos^2 \theta = 10$	(c) 1
--	-------

<i>IV.</i> $\sin x = 1$	(d) 4
-------------------------	-------

A. d, a, b, c

B. d, a, c, b

C. d, b, c, a

D. d, c, a, b

Answer: A



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2. Match the following

Trigonometric equation	General solution
<i>I.</i> $\tan^2 \theta = 1$	(a) $n\pi \pm \pi/6, n \in Z$
<i>II.</i> $\cos^2 \theta = 1/4$	(b) $n\pi \pm \pi/4, n \in Z$
<i>III.</i> $\sin^2 \theta = 1/4$	(c) $n\pi \pm \pi/3, n \in Z$
<i>IV.</i> $\cos ec^2 \theta = 1$	(d) $n\pi \pm \pi/2, n \in Z$
	(e) $n\pi \pm \pi/8, n \in Z$

A. b, d, a, c

B. c, a, e, b

C. b, c, a, d

D. d, a, b, c

Answer: C



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3. Match the following

I. $(1 + \sin 2x) - \cos x + \sin x$

(a) $\sin x = 1/2$

II. $(2 \sin x - \cos x)(1 + \cos x) = \sin^2 x$

(b) $\tan x = -1$

III. $\tan \theta + \cot \theta = 2$

(c) $\theta = \pi/6$

(d) $\theta = \pi/4$

A. a, b, c

B. b, a, d

C. c, a, b

D. d, a, b

Answer: B



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Exercise 2 Special Type Questions Set 4

1. A : The general solution of $\sin x = -1$ is
$$n\pi + (-1)^n \frac{3\pi}{2}, n \in \mathbb{Z}$$

R : The principal solution of $\sin x = 0$ lies in $[-\pi/2, \pi/2]$

A. both A and R are true and R is correct explanation of

A

B. both A and R are true and R is not the correct

explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: D



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2. A : $3 \sin x + 4 \cos x = 7$ has no solution

R : $a \cos x + b \sin x = c$ has no solution if $|c| > \sqrt{a^2 + b^2}$

- A. both A and R are true and R is correct explanation of A
- B. both A and R are true and R is not the correct explanation of A
- C. A is true but R is false
- D. A is false but R is true

Answer: A



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3. A : The general solution for $\cos \theta = 3/2$ is $\theta = 2n\pi \pm \cos^{-1}(3/2)$

R : The general solution for $\cos \theta = k$ is

$\theta = 2n\pi \pm \alpha, n \in \mathbb{Z}$ where ' α ' is principal value,

$\alpha \in [0, \pi]$ and $|k| \leq 1$

A. both A and R are true and R is correct explanation of

A

B. both A and R are true and R is not the correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: D



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4. A : The set values of x for which $\frac{\tan 3x - \tan 2x}{1 + \tan 3x \tan 2x} = 1$ is \emptyset

R : $\tan x$ is undefined at $x = \pi/2$

A. both A and R are true and R is correct explanation of

A

B. both A and R are true and R is not the correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: D



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