MATHS

BOOKS - DEEPTI MATHS (TELUGU ENGLISH)

TRIGONOMETRIC EQUATIONS

Solved Examples

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

A. π

B. $\pi/3$

C. $\pi/4$

D. $\pi/6$

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. $n\pi/2$

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

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

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

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

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

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. $2n\pi \pm \dfrac{\pi}{4}$

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

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

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

Answer: B

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

A. $210°$, $300°$

B. $240°$, $300°$

C. $210°$, $240°$

D. $210°$, $330°$

Answer: D

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

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

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

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

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

Answer: A

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Answer: A

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

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

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

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

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

Answer: C

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

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

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

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

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

Answer: D

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

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

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

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

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

Answer: C

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

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

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

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

D. none

Answer: A

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

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

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

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

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

Answer: D

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

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

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

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

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

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

Answer: B

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

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

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

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

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

Answer: D

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

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

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

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

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

Answer: B

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

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

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

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

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

Answer: C

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

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

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

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

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

Answer: B

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

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

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

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

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

Answer: D

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

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

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

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

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

Answer: D

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20. If x is an acute angle and

$\sin(x + 28°) = \cos(3x - 78°)$, 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. $n\pi + (-1)^n \dfrac{\pi}{6}$

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

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

D. $n\pi - (-1)^n \dfrac{\pi}{6}$

Answer: D

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

23. The number of roots of the equation

$2\sin^2 \theta + 3\sin \theta + 1 = 0$ in $(0, 2\pi)$ 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. $\dfrac{\sqrt{5} + 1}{2}$

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

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

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

Answer: D

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

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

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

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

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

Answer: D

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

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

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

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

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

Answer: B

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

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

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

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

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

Answer: B

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

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

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

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

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

Answer: B

29. $\left\{ x \in IR : \cos 2x + 2\cos^2 x - 2 = 0 \right\} =$

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

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

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

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

Answer: B

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

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

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

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

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

Answer: D

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

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

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

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

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

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 $r\sin\theta = \sqrt{3}, r + 4\sin\theta = 2(\sqrt{3}+1), 0 \le \theta \le 2\pi$,

then $\theta =$

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

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

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

D. none of these

Answer: B

34. If α is a root of

$25\cos^2\theta + 5\cos\theta - 12 = 0,\ \dfrac{\pi}{2} < \alpha < \pi,$ 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. $\left\{ \dfrac{\pi}{3}, \dfrac{2\pi}{3} \right\}$

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

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

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

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

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

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

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

Answer: C

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

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

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

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

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

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

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

Answer: D

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

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

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

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

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

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

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

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

Answer: B

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

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

C. $n\pi : n \in Z$ or $2n\pi \pm 109° 32' : n \in Z$

D. No solution

Answer: D

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

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

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

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

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

Answer: B

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

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

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

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

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

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

Answer: D

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

is

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

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

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

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

Answer: A

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

A. $n\pi + \dfrac{\pi}{12} : n \in Z$ or $n\pi + \dfrac{5\pi}{12} : n \in Z$

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

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

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

Answer: B

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

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

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

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

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

Answer: B

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

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

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

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

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

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. $\dfrac{n\pi}{3} + \dfrac{\pi}{9} : n \in Z$

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

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

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

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 $3\tan(\theta - 15°) = \tan(\theta + 15°), 0 < \theta < \pi$ then

$\theta =$

A. $\pi/2$

B. $\pi/4$

C. $\pi/6$

D. $\pi/3$

Answer: B

55. The smallest value of 'θ' satisfying the equation $\sqrt{3}(\cot\theta + \tan\theta) = 4$ 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 $\dfrac{2\tan x}{1 - \tan^2 x}$ is positive ?

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

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

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

    D. No solution

Answer: A

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

A. $\emptyset$

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

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

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

Answer: B

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

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

A. 1

B. 2

C. no solution

D. none

Answer: C

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. $n\pi + \dfrac{\pi}{3} : n \in Z$

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

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

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

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

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

---

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

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

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

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

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

Answer: A

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

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

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

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

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

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

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 $\tan^2\theta = 3\cos ec^2\theta - 1$ then $\theta =$

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

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

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

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

Answer: A

---

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

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

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

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

D. none

Answer: C

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

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

76. The set of solutions of the equation $(\sqrt{3} - 1)\sin\theta + (\sqrt{3} + 1)\cos\theta = 2$ is :

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

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

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

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

Answer: D

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

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

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

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

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

Answer: A

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

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

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

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

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

Answer: B

---

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

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

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

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

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

Answer: C

80. If $\cot\theta + \cos ec\theta = \sqrt{3}$ 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 $\cos ecx = 1 + \cot x$, 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

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

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

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

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

Answer: C

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

A. $n\pi$

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

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

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

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

D. none

Answer: A

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86. The values of $'\theta'$ 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. $0, \dfrac{\pi}{2}, \pi, \dfrac{3\pi}{5}$

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

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

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

Answer: C

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

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

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

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

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

Answer: B

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89. The values of θ satisfying $\sin 5\theta = \sin 3\theta - \sin \theta$ and $0 < \theta < \dfrac{\pi}{2}$ 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. $(2n+1)\dfrac{\pi}{4}: n \in Z$ or $2n\pi \pm \dfrac{2\pi}{3}: n \in Z$

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

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

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

Answer: A

---

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

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

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

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

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

Answer: D

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

$\theta =$

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

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

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

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

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. $\dfrac{\pi}{7}, \dfrac{5\pi}{7}, \pi$

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

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

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

Answer: C

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

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

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

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

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

Answer: A

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

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

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

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

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

Answer: C

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97. The sum of the solutions in $(0, 2\pi)$ of the equation cos x cos $\left(\dfrac{\pi}{3} - x\right)$ cos $\left(\dfrac{\pi}{3} + x\right) = \dfrac{1}{4}$ is

A. π

B. 2π

C. 3π

D. 4π

Answer: D

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

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

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

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

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

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

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

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

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

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

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

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

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. `npi/,npi//3

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

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

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

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

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

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

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

Answer: D

104. The solution of

$\sin 2\theta + \cos 2\theta + \sin\theta + \cos\theta + 1 = 0$ in the first

quadrant is

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

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

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

D. No solution

Answer: D

105.

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

then x =

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

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

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

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. $2n\pi : n \in Z$ or $\dfrac{2n\pi}{3} - \dfrac{\pi}{6} : n \in Z$

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

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

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

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 $\sin\left[\dfrac{\pi}{4}\cot\theta\right] = \cos\left[\dfrac{\pi}{4}\tan\theta\right]$ 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 $\tan\left(\dfrac{\pi}{2}\sin\theta\right) = \cot\left(\dfrac{\pi}{2}\cos\theta\right)$ then $\sin\left(\theta + \dfrac{\pi}{4}\right) =$

A. $\pm 1/2$

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

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

D. 2

Answer: B

110. If $\tan(\pi\cos\theta) = \cot(\pi\sin\theta)$, then prove that $\cos\left(\theta - \dfrac{\pi}{4}\right) = \pm\dfrac{1}{2\sqrt{2}}$

A. $\pm 1/2$

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

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

D. 2

Answer: C

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. $0 \leq x \leq \dfrac{\pi}{2}$

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

C. for all $x \in R$

D. $x \geq 0$

Answer: C

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

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

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. $\dfrac{\pi\sqrt{2}}{4}$

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

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

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

Answer: A

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

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

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

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

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

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

$9^{\cos x} - 2.3^{\cos x} + 1 = 0$ is

A. $n\pi$

B. $n\pi/2$

C. $2n\pi$

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

Answer: D

---

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

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

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

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

C. $-1 \le a \le 1$

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

---

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

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

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

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

D. none of these

Answer: B

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

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| + $ .... 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

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

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

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

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

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

Answer: B

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128. If the equation $(\cos p - 1)x^2 + \cos px + \sin p = 0$ in the varable 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

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

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

A. $a + b$

B. $a - b$

C. a / b

D. b / a

Answer: D

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

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

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

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

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

Answer: B

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

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

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

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

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

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. $\dfrac{c + a}{c - a}$

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

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

D. none

Answer: C

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

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

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

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

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

D. none

Answer: A

Exercise 2 Special Type Questions Set 1

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

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

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

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

II : The solution of the simultaneous equations

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

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 $\sin\left(\dfrac{\pi}{4}\cot\theta\right) = \cos\left(\dfrac{\pi}{4}\tan\theta\right)$ then

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

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

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

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

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

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 $0 \leq \theta \leq pr$, $\cos 6\theta + \cos 4\theta + \cos 2\theta + 1 = 0$ 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
$I.\ \tan^2 x + \cot^2 x = 2$	$(a)2$
$II.\ \sin^2 x - \cos x = 1/4$	$(b)0$
$III.\ 4\sin^2 \theta + 6\cos^2 \theta = 10$	$(c)1$
$IV.\ \sin x = 1$	$(d)4$

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

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

$n\pi + (-1)^n \dfrac{3\pi}{2}, n \in Z$

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

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

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

$\theta = 2n\pi \pm \alpha, n \in Z$ where $'\alpha'$ 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

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

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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