

Tarun Classes of Mathematics

IIT-JEE Mains | CBSE | PU-CET | NDA

Talwara Township, Hoshiarpur | +91 9463672753 | tarunclasses.in

Trigonometry Ratios and Equations

Subjects : Maths

Previous Year Questions of JEE
Mains

Maths - Section A (MCQ.)

- The sum of all the integral values of p such that the equation $3 \sin^2 x + 12 \cos x - 3 = p$, $x \in \mathbb{R}$, has at least one solution, is:
A) -54 B) -60 C) -75 D) -84
- Let $S = \{x \in [-\pi, \pi] : \sin x(\sin x + \cos x) = a, a \in \mathbb{Z}\}$. Then $n(S)$ is equal to :
A) 3 B) 6 C) 7 D) 9
- If $S = \left\{ \theta \in [-\pi, \pi] : \cos \theta \cos \frac{5\theta}{2} = \cos 7\theta \cos \frac{7\theta}{2} \right\}$, then $n(S)$ is equal to _____.
A) 19 B) 22 C) 26 D) 28
- If $\sin\left(\frac{\pi}{18}\right) \sin\left(\frac{5\pi}{18}\right) \sin\left(\frac{7\pi}{18}\right) = K$, then the value of $\sin\left(\frac{10K\pi}{3}\right)$ is :
A) $\frac{\sqrt{3}+1}{2\sqrt{2}}$ B) $\frac{\sqrt{3}-1}{\sqrt{2}}$ C) $\frac{\sqrt{3}}{2}$ D) $\frac{1}{2}$
- If $\cot x = \frac{5}{12}$ for some $x \in (\pi, \frac{3\pi}{2})$, then $\sin 7x(\cos \frac{13x}{2} + \sin \frac{13x}{2}) + \cos 7x(\cos \frac{13x}{2} - \sin \frac{13x}{2})$ is equal to
A) $\frac{4}{\sqrt{26}}$ B) $\frac{6}{\sqrt{26}}$ C) $\frac{1}{\sqrt{13}}$ D) $\frac{5}{\sqrt{13}}$
- The value of $\frac{\sqrt{3}\csc 20^\circ - \sec 20^\circ}{\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ}$ is equal to
A) 32 B) 16 C) 64 D) 12
- Let $\frac{\pi}{2} < \theta < \pi$ and $\cot \theta = -\frac{1}{2\sqrt{2}}$. Then the value of $\sin(\frac{15\theta}{2})(\cos 8\theta + \sin 8\theta) + \cos(\frac{15\theta}{2})(\cos 8\theta - \sin 8\theta)$ is equal to:
A) $\frac{1-\sqrt{2}}{\sqrt{3}}$ B) $-\frac{\sqrt{2}}{\sqrt{3}}$ C) $\frac{\sqrt{2}-1}{\sqrt{3}}$ D) $\frac{\sqrt{2}}{\sqrt{3}}$
- If $\sum_{r=1}^{13} \left\{ \frac{1}{\sin(\frac{\pi}{4} + (r-1)\frac{\pi}{6}) \sin(\frac{\pi}{4} + r\frac{\pi}{6})} \right\} = a\sqrt{3} + b$, $a, b \in \mathbb{Z}$, then $a^2 + b^2$ is equal to :
A) 10 B) 4 C) 2 D) 8
- If $10 \sin^4 \theta + 15 \cos^4 \theta = 6$, then the value of $\frac{27 \csc^6 \theta + 8 \sec^6 \theta}{16 \sec^8 \theta}$ is:
A) $\frac{2}{5}$ B) $\frac{3}{4}$ C) $\frac{3}{5}$ D) $\frac{1}{5}$
- If $\sin x + \sin^2 x = 1$, $x \in (0, \frac{\pi}{2})$, then $(\cos^{12} x + \tan^{12} x) + 3(\cos^{10} x + \tan^{10} x + \cos^8 x + \tan^8 x) + (\cos^6 x + \tan^6 x)$ is equal to :
A) 4 B) 1 C) 3 D) 2
- For $\alpha, \beta \in (0, \frac{\pi}{2})$, let $3 \sin(\alpha + \beta) = 2 \sin(\alpha - \beta)$ and a real number k be such that $\tan \alpha = k \tan \beta$. Then the value of k is equal to :

A) $-\frac{2}{3}$

B) -5

C) $\frac{2}{3}$

D) 5

12. If $2\sin^3 x + \sin 2x \cos x + 4\sin x - 4 = 0$ has exactly 3 solutions in the interval $[0, \frac{n\pi}{2}]$, $n \in \mathbb{N}$, then the roots of the equation $x^2 + nx + (n-3) = 0$ belong to :

A) $(0, \infty)$

B) $(-\infty, 0)$

C) $(-\frac{\sqrt{17}}{2}, \frac{\sqrt{17}}{2})$

D) $\mathbb{Z}$

13. The least value of $(\cos^2 \theta - 6\sin \theta \cos \theta + 3\sin^2 \theta + 2)$ is:

A) -1

B) $4 + \sqrt{10}$

C) $4 - \sqrt{10}$

D) 1

14. The sum of the solutions $x \in \mathbb{R}$ of the equation $\frac{3\cos 2x + \cos^3 2x}{\cos^6 x - \sin^6 x} = x^3 - x^2 + 6$ is

A) 0

B) 1

C) -1

D) 3

15. Let $S = \{\theta \in (-2\pi, 2\pi) : \cos \theta + 1 = \sqrt{3} \sin \theta\}$. Then $\sum_{\theta \in S} \theta$ is equal to:

A) $-\frac{2\pi}{3}$

B) $-\frac{4\pi}{3}$

C) $\frac{2\pi}{3}$

D) $\frac{4\pi}{3}$

16. Number of solutions of $\sqrt{3} \cos 2\theta + 8 \cos \theta + 3\sqrt{3} = 0$, $\theta \in [-3\pi, 2\pi]$ is:

A) 0

B) 5

C) 3

D) 4

17. The number of solutions of the equation $2x + 3 \tan x = \pi$, $x \in [-2\pi, 2\pi] - \{\pm \frac{\pi}{2}, \pm \frac{3\pi}{2}\}$ is

A) 6

B) 5

C) 4

D) 3

18. If $\theta \in [-2\pi, 2\pi]$, then the number of solutions of $2\sqrt{2} \cos^2 \theta + (2 - \sqrt{6}) \cos \theta - \sqrt{3} = 0$, is equal to:

A) 12

B) 6

C) 8

D) 10

19. The sum of all values of $\theta \in [0, 2\pi]$ satisfying $2\sin^2 \theta = \cos 2\theta$ and $2\cos^2 \theta = 3\sin \theta$ is

A) 4π

B) $\frac{5\pi}{6}$

C) π

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

20. The number of solutions of the equation $4\sin^2 x - 4\cos^3 x + 9 - 4\cos x = 0$; $x \in [-2\pi, 2\pi]$ is :

A) 1

B) 3

C) 2

D) 0

21. The number of solutions of the equation $32^{\tan^2 x} + 32^{\sec^2 x} = 81$, $0 \leq x \leq \frac{\pi}{4}$ is :

A) 3

B) 1

C) 0

D) 2

22. Let $S = \{x \in (-\frac{\pi}{2}, \frac{\pi}{2}) : 9^{1-\tan^2 x} + 9^{\tan^2 x} = 10\}$ and $\beta = \sum_{x \in S} \tan^2(\frac{x}{3})$, then $\frac{1}{6}(\beta - 14)^2$ is equal to

A) 32

B) 8

C) 64

D) 16

Maths - Section B (Numeric)

23. $96 \cos \frac{\pi}{33} \cos \frac{2\pi}{33} \cos \frac{4\pi}{33} \cos \frac{8\pi}{33} \cos \frac{16\pi}{33}$ is equal to.....

24. If $\frac{\cos^2 48^\circ - \sin^2 12^\circ}{\sin^2 24^\circ - \sin^2 6^\circ} = \frac{\alpha + \beta\sqrt{5}}{2}$, where $\alpha, \beta \in \mathbb{N}$, then $\alpha + \beta$ is equal to ____.

25. If $A = \frac{\sin 3^\circ}{\cos 9^\circ} + \frac{\sin 9^\circ}{\cos 27^\circ} + \frac{\sin 27^\circ}{\cos 81^\circ}$ and $B = \tan 81^\circ - \tan 3^\circ$, then $\frac{B}{A}$ is equal to ____.

26. Let $\cos(\alpha + \beta) = -\frac{1}{10}$ and $\sin(\alpha - \beta) = \frac{3}{8}$ where $0 < \alpha < \frac{\pi}{3}$ and $0 < \beta < \frac{\pi}{4}$. If $\tan 2\alpha = \frac{3(1-r\sqrt{5})}{\sqrt{11}(s+\sqrt{5})}$, $r, s \in \mathbb{N}$, then $r + s$ is equal to ____.

27. Let $S = \{\theta \in [0, 2\pi) : \tan(\pi \cos \theta) + \tan(\pi \sin \theta) = 0\}$. Then $\sum_{\theta \in S} \sin^2(\theta + \frac{\pi}{4})$ is equal to

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Maths - Section A (MCQ.)

1 - C	2 - D	3 - A	4 - A	5 - C	6 - C	7 - A	8 - D	9 - A	10 - D
11 - B	12 - B	13 - C	14 - C	15 - B	16 - B	17 - B	18 - C	19 - C	20 - D
21 - B	22 - A								

Maths - Section B (Numeric)

23 - 3	24 - 4	25 - 2	26 - 20	27 - 2
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