

JEE MAIN TRIGONOMETRIC FUNCTIONS — TRIGONOMETRIC EQUATIONS AND GENERAL SOLUTIONS — PYQS

Max. Marks: 84

Questions: 21

Section A (MCQ) — 17 questions

Q.1 Let $S = \{\theta \in (-2\pi, 2\pi) : \cos \theta + 1 = \sqrt{3} \sin \theta\}$.

Then $\sum_{\theta \in S} \theta$ is equal to :

[JEE Main 2026 (Online) 6th April Morning Shift]

- (1) $-\frac{2\pi}{3}$ (2) $-\frac{4\pi}{3}$ (3) $\frac{2\pi}{3}$ (4) $\frac{4\pi}{3}$

Scan or tap for the full solution



Q.2 Let $S = \{x \in [-\pi, \pi] : \sin x(\sin x + \cos x) = a, a \in \mathbb{Z}\}$.

Then $n(S)$ is equal to :

[JEE Main 2026 (Online) 2nd April Morning Shift]

- (1) 3 (2) 6 (3) 7 (4) 9

Scan or tap for the full solution



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

[JEE Main 2026 (Online) 23rd January Morning Shift]

- (1) 5 (2) 4 (3) 3 (4) 0

Scan or tap for the full solution



Q.4 The number of solutions of the equation $\cos 2\theta \cos \frac{\theta}{2} + \cos \frac{5\theta}{2} = 2 \cos^3 \frac{5\theta}{2}$ in $[-\frac{\pi}{2}, \frac{\pi}{2}]$ is :

[JEE Main 2025 (Online) 7th April Evening Shift]

- (1) 5 (2) 7 (3) 6 (4) 9

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Q.5 The number of solutions of the equation $2x + 3 \tan x = \pi, x \in [-2\pi, 2\pi] - \left\{\pm \frac{\pi}{2}, \pm \frac{3\pi}{2}\right\}$ is:

[JEE Main 2025 (Online) 3rd April Morning Shift]

- (1) 4 (2) 5 (3) 3 (4) 6

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Q.6 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:

[JEE Main 2025 (Online) 2nd April Morning Shift]

- (1) 8 (2) 6 (3) 10 (4) 12

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Q.7 The number of solutions of the equation $(4 - \sqrt{3}) \sin x - 2\sqrt{3} \cos^2 x = -\frac{4}{1 + \sqrt{3}}, x \in \left[-2\pi, \frac{5\pi}{2}\right]$ is

[JEE Main 2025 (Online) 3rd April Evening Shift]

- (1) 4 (2) 3 (3) 6 (4) 5

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Q.8 If $\theta \in \left[-\frac{7\pi}{6}, \frac{4\pi}{3}\right]$, then the number of solutions of $\sqrt{3} \operatorname{cosec}^2 \theta - 2(\sqrt{3} - 1) \operatorname{cosec} \theta - 4 = 0$, is equal to :

[JEE Main 2025 (Online) 2nd April Evening Shift]

- (1) 7 (2) 10 (3) 6 (4) 8

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Q.9 Let $A = \left\{x \in (0, \pi) - \left\{\frac{\pi}{2}\right\} : \log_{(2/\pi)} |\sin x| + \log_{(2/\pi)} |\cos x| = 2\right\}$ and $B = \{x \geq 0 : \sqrt{x}(\sqrt{x} - 4) - 3|\sqrt{x} - 2| + 6 = 0\}$. Then $n(A \cup B)$ is equal to :

[JEE Main 2025 (Online) 24th January Evening Shift]

- (1) 4 (2) 8 (3) 6 (4) 2

Scan or tap for the full solution



Q.10 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

[JEE Main 2025 (Online) 22nd January Evening Shift]

- (1) π (2) $\frac{5\pi}{6}$ (3) $\frac{\pi}{2}$ (4) 4π

Scan or tap for the full solution



Q.11 Let $|\cos \theta \cos(60^\circ - \theta) \cos(60^\circ + \theta)| \leq \frac{1}{8}, \theta \in [0, 2\pi]$. Then, the sum of all $\theta \in [0, 2\pi]$, where $\cos 3\theta$ attains its maximum value, is :

[JEE Main 2024 (Online) 9th April Morning Shift]

- (1) 6π (2) 9π (3) 18π (4) 15π

Scan or tap for the full solution



Q.12 Suppose $\theta \in \left[0, \frac{\pi}{4}\right]$ is a solution of $4 \cos \theta - 3 \sin \theta = 1$. Then $\cos \theta$ is equal to :

[JEE Main 2024 (Online) 5th April Morning Shift]

(1) $\frac{6 - \sqrt{6}}{(3\sqrt{6} - 2)}$

(2) $\frac{4}{(3\sqrt{6} + 2)}$

(3) $\frac{6 + \sqrt{6}}{(3\sqrt{6} + 2)}$

(4) $\frac{4}{(3\sqrt{6} - 2)}$

Scan or tap for the full solution



Q.13 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 :

[JEE Main 2024 (Online) 1st February Evening Shift]

- (1) 0 (2) 3 (3) 1 (4) 2

Scan or tap for the full solution



Q.14 The number of solutions, of the equation $e^{\sin x} - 2e^{-\sin x} = 2$, is :

[JEE Main 2024 (Online) 31st January Evening Shift]

- (1) 0 (2) 1
-
- (3) 2 (4) more than 2

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Q.15 If $2\sin^3 x + \sin 2x \cos x + 4\sin x - 4 = 0$ has exactly 3 solutions in the interval $\left[0, \frac{n\pi}{2}\right]$, $n \in \mathbb{N}$, then the roots of the equation $x^2 + nx + (n - 3) = 0$ belong to :

[JEE Main 2024 (Online) 30th January Morning Shift]

- (1)
- $(0, \infty)$
- (2)
- $\mathbb{Z}$
-
- (3)
- $\left(-\frac{\sqrt{17}}{2}, \frac{\sqrt{17}}{2}\right)$
- (4)
- $(-\infty, 0)$

Scan or tap for the full solution



Q.16 If α , $-\frac{\pi}{2} < \alpha < \frac{\pi}{2}$ is the solution of $4\cos \theta + 5\sin \theta = 1$, then the value of $\tan \alpha$ is

[JEE Main 2024 (Online) 29th January Morning Shift]

- (1)
- $\frac{10 - \sqrt{10}}{12}$
- (2)
- $\frac{\sqrt{10} - 10}{6}$
-
- (3)
- $\frac{\sqrt{10} - 10}{12}$
- (4)
- $\frac{10 - \sqrt{10}}{6}$

Scan or tap for the full solution



Q.17 If $2\tan^2 \theta - 5\sec \theta = 1$ has exactly 7 solutions in the interval $\left[0, \frac{n\pi}{2}\right]$, for the least value of $n \in \mathbb{N}$, then

 $\sum_{k=1}^n \frac{k}{2^k}$ is equal to:

[JEE Main 2024 (Online) 27th January Evening Shift]

- (1)
- $\frac{1}{2^{14}}(2^{15} - 15)$
- (2)
- $1 - \frac{15}{2^{13}}$
-
- (3)
- $\frac{1}{2^{15}}(2^{14} - 14)$
- (4)
- $\frac{1}{2^{13}}(2^{14} - 15)$

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Section B (Numerical) — 4 questions

Q.18 If $S = \{\theta \in [-\pi, \pi] : \cos \theta \cos \frac{5\theta}{2} = \cos 7\theta \cos \frac{7\theta}{2}\}$, then $n(S)$ is equal to _____.

[JEE Main 2026 (Online) 5th April Evening Shift]

Scan or tap for the full solution



Q.19 The number of elements in the set $\{x \in [0, 180^\circ] : \tan(x + 100^\circ) = \tan(x + 50^\circ) \tan x \tan(x - 50^\circ)\}$ is _____.

[JEE Main 2026 (Online) 24th January Evening Shift]

Scan or tap for the full solution



Q.20 The number of solutions of $\sin^2 x + (2 + 2x - x^2)\sin x - 3(x - 1)^2 = 0$, where $-\pi \leq x \leq \pi$, is _____.

[JEE Main 2024 (Online) 5th April Evening Shift]

Scan or tap for the full solution



Q.21 Let the set of all $a \in \mathbb{R}$ such that the equation $\cos 2x + a \sin x = 2a - 7$ has a solution be $[p, q]$ and $r = \tan 9^\circ - \tan 27^\circ - \frac{1}{\cot 63^\circ} + \tan 81^\circ$, then pqr is equal to _____.

[JEE Main 2024 (Online) 27th January Morning Shift]

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ANSWER KEY

Section A (MCQ) — 17 questions

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	2	4	1	2	2	1	4	3	2	1	1
Ques.	12	13	14	15	16	17					
Ans.	4	1	1	4	3	4					

Section B (Numerical) — 4 questions

Ques.	18	19	20	21							
Ans.	19	4	2	48							