

MATHEMATICS · JEE MAIN

Trigonometric Ratios & Identities

Chapter-wise previous year questions, with answer key

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PYQS

2020–2024

PAPERS

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TOPICS

Maximum and Minimum Values

Multiple and Sub-Multiple Angles

Trigonometric Ratios and Signs

- 1 Attempt each question on paper first — they're grouped by topic, newest papers first.
- 2 Check yourself against the answer key at the end.
- 3 Got one wrong? Tap “Step-by-step solution” under it for the full working.

Stuck on a question?

Every question has a free step-by-step solution on PrepWiser — tap “Step-by-step solution” under it.

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Maximum and Minimum Values · 8 PYQs

Q1 JEE Main 2024 · 9 Apr · Shift 2

Let the range of the function $f(x) = \frac{1}{2 + \sin 3x + \cos 3x}$, $x \in \mathbb{R}$ be $[a, b]$. If α and β are respectively the A.M. and the G.M. of a and b , then $\frac{\alpha}{\beta}$ is equal to

- (A) π (B) $\sqrt{\pi}$
(C) $\sqrt{2}$ (D) 2

[Step-by-step solution ► prepwisar.in/questions/kVlg0d6-z9](https://www.prepwisar.in/questions/kVlg0d6-z9)

Q2 JEE Main 2024 · 9 Apr · Shift 1

Let

$$|\cos \theta \cos(60 - \theta) \cos(60 + \theta)| \leq \frac{1}{8}, \theta \in [0, 2\pi]$$

. Then, the sum of all $\theta \in [0, 2\pi]$, where $\cos 3\theta$ attains its maximum value, is :

- (A) 6π (B) 9π
(C) 18π (D) 15π

[Step-by-step solution ► prepwisar.in/questions/QLmjSNIADt](https://www.prepwisar.in/questions/QLmjSNIADt)

Q3 JEE Main 2024 · 8 Apr · Shift 1

If the range of

$$f(\theta) = \frac{\sin^4 \theta + 3 \cos^2 \theta}{\sin^4 \theta + \cos^2 \theta}, \theta \in \mathbb{R}$$

is $[\alpha, \beta]$, then the sum of the infinite G.P., whose first term is 64 and the common ratio is $\frac{\alpha}{\beta}$, is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisar.in/questions/iuyi1Fqh6m](https://www.prepwisar.in/questions/iuyi1Fqh6m)

Q4 JEE Main 2023 · 13 Apr · Shift 1

$$\max_{0 \leq x \leq \pi} \left\{ x - 2 \sin x \cos x + \frac{1}{3} \sin 3x \right\} =$$

- (A) $\frac{5\pi+2+3\sqrt{3}}{6}$ (B) 0
(C) $\frac{\pi+2-3\sqrt{3}}{6}$ (D) π

[Step-by-step solution ► prepwisar.in/questions/Xj4rOIY_La](https://www.prepwisar.in/questions/Xj4rOIY_La)

Q5 JEE Main 2022 · 29 Jul · Shift 2

The number of elements in the set

$$S = \left\{ x \in \mathbb{R} : 2 \cos \left(\frac{x^2 + x}{6} \right) = 4^x + 4^{-x} \right\}$$

is :

(A) 1

(B) 3

(C) 0

(D) infinite

[Step-by-step solution ► prepwisser.in/questions/ud0WDz3HNA](https://www.prepwisser.in/questions/ud0WDz3HNA)

Q6 JEE Main 2021 · 1 Sep · Shift 2

The range of the function,

$$f(x) = \log_{\sqrt{5}} \left(3 + \cos \left(\frac{3\pi}{4} + x \right) + \cos \left(\frac{\pi}{4} + x \right) + \cos \left(\frac{\pi}{4} - x \right) - \cos \left(\frac{3\pi}{4} - x \right) \right)$$

is :

(A) $(0, \sqrt{5})$

(B) $[-2, 2]$

(C) $\left[\frac{1}{\sqrt{5}}, \sqrt{5} \right]$

(D) $[0, 2]$

[Step-by-step solution ► prepwisser.in/questions/9wpBpTdkUD](https://www.prepwisser.in/questions/9wpBpTdkUD)

Q7 JEE Main 2021 · 27 Jul · Shift 2

Let $\alpha = \max_{x \in \mathbb{R}} \{8^{2 \sin 3x} \cdot 4^{4 \cos 3x}\}$ and $\beta = \min_{x \in \mathbb{R}} \{8^{2 \sin 3x} \cdot 4^{4 \cos 3x}\}$. If $8x^2 + bx + c = 0$ is a quadratic equation

whose roots are $\alpha^{1/5}$ and $\beta^{1/5}$, then the value of $c - b$ is equal to :

(A) 42

(B) 47

(C) 43

(D) 50

[Step-by-step solution ► prepwisser.in/questions/Y2CV6n5ZQ9](https://www.prepwisser.in/questions/Y2CV6n5ZQ9)

Q8 JEE Main 2020 · 4 Sep · Shift 2

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

(A) $2^{-1+\sqrt{2}}$

(B) $2^{1-\frac{1}{\sqrt{2}}}$

(C) $2^{1-\sqrt{2}}$

(D) $2^{-1+\frac{1}{\sqrt{2}}}$

[Step-by-step solution ► prepwisser.in/questions/OZv31awAoy](https://www.prepwisser.in/questions/OZv31awAoy)

Multiple and Sub-Multiple Angles · 2 PYQs

Q9 JEE Main 2024 · 29 Jan · Shift 1

Consider the function $f : \left[\frac{1}{2}, 1\right] \rightarrow \mathbb{R}$ defined by $f(x) = 4\sqrt{2}x^3 - 3\sqrt{2}x - 1$. Consider the statements

(I) The curve $y = f(x)$ intersects the x -axis exactly at one point.

(II) The curve $y = f(x)$ intersects the x -axis at $x = \cos \frac{\pi}{12}$.

Then

(A) Both (I) and (II) are correct.

(B) Only (I) is correct.

(C) Both (I) and (II) are incorrect.

(D) Only (II) is correct.

[Step-by-step solution ► prepwiser.in/questions/LDJf5-xrvF](https://www.prepwiser.in/questions/LDJf5-xrvF)

Q10 JEE Main 2021 · 31 Aug · Shift 1

$\operatorname{cosec} 18^\circ$ is a root of the equation :

(A) $x^2 + 2x - 4 = 0$

(B) $4x^2 + 2x - 1 = 0$

(C) $x^2 - 2x + 4 = 0$

(D) $x^2 - 2x - 4 = 0$

[Step-by-step solution ► prepwiser.in/questions/T7fIj8h3kL](https://www.prepwiser.in/questions/T7fIj8h3kL)

Trigonometric Ratios and Signs · 1 PYQs

Q11 JEE Main 2024 · 27 Jan · Shift 2

For $0 < a < 1$, the value of the integral $\int_0^\pi \frac{dx}{1 - 2a \cos x + a^2}$ is :

(A) $\frac{\pi^2}{\pi + a^2}$

(B) $\frac{\pi^2}{\pi - a^2}$

(C) $\frac{\pi}{1 - a^2}$

(D) $\frac{\pi}{1 + a^2}$

[Step-by-step solution ► prepwiser.in/questions/BljRCsWzaw](https://www.prepwiser.in/questions/BljRCsWzaw)

Answer key — Trigonometric Ratios & Identities

Numbers match the question numbers above. For full working, open the solution link under each question.

1	C	2	A	3	96	4	A	5	A	6	D	7	A	8	B
9	A	10	D	11	C										

Want the next chapter?

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