Top JEE Main Trigonometry Questions with Answers

Top JEE Main Trigonometry Questions with answers are provided below step-wise for students; these questions are frequently asked in JEE Main 2026. The weightage of trigonometry in the exam is almost 4 to 5 questions asked in each shift.

Question 1: The general solution of $\sin x - 3 \sin^2 x + \sin^3 x = \cos x - 3 \cos^2 x + \cos^3 x$ is?

Answer: $\sin x - 3 \sin^2 x + \sin^3 x = \cos x - 3 \cos^2 x + \cos^3 x$

$= 2 \sin^2 x \cos x - 3 \sin^2 x - 2 \cos^2 x \cos x + 3 \cos^2 x = 0$

$= \sin^2 x (2\cos x - 3) - \cos^2 x (2 \cos x - 3) = 0$

$= (\sin^2 x - \cos^2 x)(2 \cos x - 3) = 0$

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

$= \tan 2x = 1$

$= 2x = n\pi + (\pi / 4)$

$= x = n\pi / 2 + \pi / 8$

Question 2: If $\sec 4\theta - \sec 2\theta = 2$, then the general value of θ is?

Answer: $\sec 4\theta - \sec 2\theta = 2 \Rightarrow \cos 2\theta - \cos 4\theta = 2 \cos 4\theta \cos 2\theta$

$= -\cos 4\theta = \cos 6\theta$

$= 2 \cos 5\theta \cos \theta = 0$

$=$When $\cos 5\theta = 0$, $5\theta = (2n + 1)\pi/2$

$=$So $\theta = n\pi/5 + \pi/10$

$= (2n + 1)\pi/10$

=When $\cos\theta = 0$, $\theta = (2n+1)\pi/2$.

Question 3: If tan (cot x) = cot (tan x), then sin 2x ?

Answer: $\tan(\cot x) = \cot(\tan x) \Rightarrow \tan(\cot x) = \tan(\pi / 2 - \tan x)$

$=\cot x = n\pi + \pi / 2 - \tan x$

$=\cot x + \tan x = n\pi + \pi / 2$

$=1/\sin x \cos x = n\pi + \pi / 2$

$=1/\sin 2x = n\pi/2 + \pi / 4$

$=\sin 2x = 2 / [n\pi + \{\pi / 2\}]$

$= 4 / \{(2n + 1) \pi\}$

Question 4: If the solutions for θ of $\cos p\theta + \cos q\theta = 0$, $p > 0$, $q > 0$ are in A.P., then numerically the smallest common difference of A.P. is?

Answer: Given $\cos p\theta = -\cos q\theta = \cos(\pi + q\theta)$

$=p\theta = 2n\pi \pm (\pi + q\theta)$, $n \in I$

$=\theta = [(2n + 1)\pi] / [p - q]$ or $[(2n - 1)\pi] / [p + q]$, $n \in I$

Both the solutions form an A.P. $\theta = [(2n + 1)\pi] / [p - q]$ gives us an A.P. with common difference $2\pi / [p - q]$ and $\theta = [(2n - 1)\pi] / [p + q]$ gives us an A.P. with common difference $= 2\pi / [p + q]$.

Certainly, $\{2\pi / [p + q]\} < \{|2\pi / [p - q]|\}$.

Question 5: If α, β are different values of x satisfying a cosx + b sinx = c, then tan ([α + β] / 2) =?

Answer: a cost + b six = c ⇒ a {[(1 − tan2 (x / 2)] / [1 + tan2 (x / 2)]} + 2b {[tan (x / 2) / 1 + tan2 (x / 2)} = c

$=(a + c) * \tan^2 [x / 2] - 2b \tan [x / 2] + (c - a) = 0$

This equation has roots $\tan [\alpha / 2]$ and $\tan [\beta / 2]$.

Therefore, $\tan [\alpha / 2] + \tan [\beta / 2] = 2b / [a + c]$ and $\tan [\alpha / 2] * \tan [\beta / 2]$

$= [c - a] / [a + c]$

Now $\tan ((\alpha + \beta)/2) = \{\tan [\alpha / 2] + \tan [\beta / 2]\} / \{1 - \tan [\alpha / 2] * \tan [\beta / 2]\}$

$= \{[2b] / [a + c]\} / \{1- ([c - a] / [a + c])\}$

$= b/a$

Question 6: In a triangle, the lengths of the two larger sides are 10 cm and 9 cm, respectively. If the angles of the triangle are in arithmetic progression, then what can the length of the third side be in cm?

Answer: We know that in a triangle, the larger the side, the larger the angle.

Since angles $\angle A$, $\angle B$, and $\angle C$ are in A.P.

Hence, $\angle B = 60^o$ cost $= [a^2 + c^2 - b^2] / [2ac]$

$=1 / 2 = [100 + a^2 - 81] / [20a]$

$=a^2 + 19 = 10a$

$=a^2 - 10a + 19 = 0$

$=a = 10 \pm (\sqrt{[100 - 76]} / [2])$

$=a = 5 \pm \sqrt{6}$

Question7: In triangle ABC, if $\angle A = 45^\circ$, $\angle B = 75^\circ$, then $a + c\sqrt{2}$ =?

Answer: $\angle C = 180^o - 45^o - 75^o = 60^o$

$=a/\sin A = b/\sin b = c/\sin C$

$=a/\sin 45 = b/\sin 75 = c/\sin 60$

$=\sqrt{2}a = 2\sqrt{2}b/(\sqrt{3}+1) = 2c/\sqrt{3}$

$=a = 2b/(\sqrt{3}+1)$

$=c = \sqrt{6}b/(\sqrt{3}+1)$

$=a+\sqrt{2}c = [2b/(\sqrt{3}+1)] + [\sqrt{12}b/(\sqrt{3}+1)]$

=Solving, we get 2b

Question 8: If $\cos-1\ p + \cos-1\ q + \cos-1\ r = \pi$ then $p^2 + q^2 + r^2 + 2pqr$ = ?

Answer: Given $\cos-1\ p + \cos-1\ q + \cos-1\ r = \pi$

$=\cos-1\ p + \cos-1\ q = \pi - \cos-1\ r$

$=\cos^{-1} (pq - \sqrt{(1 - p^2)} \sqrt{(1 - q^2)} = \cos^{-1} (-r)$

$=(pq - \sqrt{(1 - p^2)} \sqrt{(1 - q^2)} = -r$

$=(pq + r) = \sqrt{(1 - p^2)} \sqrt{(1 - q^2)}$

squaring

$=(pq + r)2 = (1 - p^2) (1 - q2)$

$=p^2q^2 + 2pqr + r^2 = 1 - p^2 - q^2 + p^2q^2$

$=p^2 + q^2 + r^2 + 2pqr = 1$

Question 9: $\tan [(\pi / 4) + (1 / 2) * \cos^{-1} (a / b)] + \tan [(\pi / 4) - (1 / 2) \cos^{-1} .(a / b)] = ?$

Answer: $\tan [(\pi / 4) + (1 / 2) * \cos^{-1} (a / b)] + \tan [(\pi / 4) - (1 / 2) \cos^{-1} .(a / b)]$

=Let $(1 / 2) * \cos^{-1} (a / b) = \theta$

$=\cos 2\theta = a / b$

=Thus, $\tan [\{\pi / 4\} + \theta] + \tan [\{\pi / 4\} - \theta] = [(1 + \tan\theta) / (1 - \tan\theta)]+ ([1 - \tan\theta] / [1 + \tan\theta])$

$= [(1 + \tan\theta)^2 + (1 - \tan\theta)^2] / [(1 - \tan^2\theta)]$

$= [1 + \tan^2\theta + 2\tan\theta + 1 + \tan^2\theta - 2\tan\theta] / [(1 - \tan^2\theta)]$

$= 2 (1 + \tan^2\theta) / [(1 - \tan^2\theta)]$

$= 2 \sec^2\theta \cos^2\theta/(\cos^2\theta - \sin^2\theta)$

$= 2 /\cos^2\theta$

$= 2 / [a / b]$

$= 2b / a$

Question 10: The number of real solutions of $\tan^{-1} \sqrt{[x (x + 1)]} + \sin^{-1} [\sqrt{(x2 + x + 1)}] = \pi / 2$ is ?

Answer: $\tan^{-1} \sqrt{[x (x + 1)]} + \sin^{-1} [\sqrt{(x2 + x + 1)}] = \pi / 2$

$\tan^{-1} \sqrt{[x (x + 1)]}$ is defined when $x (x + 1) \geq 0$ ..(i)

$\sin^{-1} [\sqrt{x2 + x + 1}]$ is defined when $0 \leq x (x + 1) + 1 \leq 1$ or $x2 + x + 1 \geq 1$ ..(ii)

From (i) and (ii), $x (x + 1) = 0$ or $x = 0$ and -1.

Hence, the number of solutions is 2.