

THE ZENITH Questions

For CRT - 06

BY O.P. GUPTA

Max. Marks : 30

INDIRA AWARD WINNER

Time : 60 Minutes

M.+91 9650350480

Topics : Trigonometric Functions

Advanced MATH Classes, 1st Floor (Above Master Of Burgers), Opp. HP Petrol Pump, Thana Road, Najafgarh

Q01. Solve : $\cos 2x - \sqrt{3} \sin 2x = 1$.

Q02. Find $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $\cot \frac{x}{2}$ if $\cot x = -\frac{3}{4}$ such that x lies in IV quadrant.

Q03. Find the value of $\operatorname{cosec} 22^\circ 30'$. [4 × 3 = 12]

Q04. If $\cot \theta = \frac{1}{2}$, $\sec \beta = -\frac{5}{3}$ where θ lies in III quadrant and β lies in II quadrant, then determine the value of $\sin(\theta - \beta)$ and, $\sin 2\theta$.

Q05. Solve : $\cos A \cos 2A \cos 3A = \frac{1}{4}$.

(OR) Solve : $\tan \theta + \tan 2\theta + \sqrt{3} \tan \theta \tan 2\theta = \sqrt{3}$.

Q06. Draw the graph of $f(x) = 3 \cos 2x$. Also write its domain and range.

(OR) If $\tan \frac{\theta}{2} = \sqrt{\frac{a-b}{a+b}} \tan \frac{\phi}{2}$ then, show that $\cos \theta = \frac{a \cos \phi + b}{a + b \cos \phi}$. [6 × 3 = 18]

INDIRA Award Winner O.P. Gupta is author of several popular books on Mathematics for Classes XII and XI. These books can be bought at : www.iMathematicia.com.

Hints & Answers Of CRT-05

Q01. We have $\cos 2x - \sqrt{3} \sin 2x = 1 \Rightarrow \frac{1}{2} \cos 2x - \frac{\sqrt{3}}{2} \sin 2x = \frac{1}{2}$
 $\Rightarrow \cos\left(2x + \frac{\pi}{3}\right) = \cos\left(\frac{\pi}{3}\right) \Rightarrow \left(2x + \frac{\pi}{3}\right) = 2n\pi \pm \left(\frac{\pi}{3}\right), n \in \mathbb{Z}$
 $\therefore x = n\pi$ or $n\pi - \frac{\pi}{3}, n \in \mathbb{Z}.$

Q02. $\frac{1}{\sqrt{5}}, -\frac{2}{\sqrt{5}}, -2.$

Q03. Note that $\operatorname{cosec} 22^\circ 30' = \operatorname{cosec}\left(22^\circ + \left(\frac{1}{2}\right)^\circ\right) = \operatorname{cosec}\left(\frac{45}{2}\right)^\circ = \operatorname{cosec} \frac{\pi}{8}$

Now $\operatorname{cosec} \frac{\pi}{8} = \frac{1}{\sin(\pi/8)} = \frac{1}{\sqrt{\frac{1 - \cos(\pi/4)}{2}}} = \sqrt{\frac{2}{1 - \frac{1}{\sqrt{2}}}} = \sqrt{\frac{2\sqrt{2}}{\sqrt{2} - 1}}.$

Q04. $\frac{2}{\sqrt{5}}, \frac{4}{5}.$

Q05. See *Mathematica Vol.1* by O.P. Gupta.

(OR) $(3n + 1)\frac{\pi}{9}, n \in \mathbb{Z}.$

Q06. See *Mathematica Vol.1* by O.P. Gupta

(OR) See *Mathematica Vol.1* by O.P. Gupta.

❖ Dear Student/Teacher,

I would urge you for a little favour. Please notify me about any error (s) which you notice in this (or other Maths) work. It would be beneficial for all the future learners of Maths like us. Any constructive criticism will be well acknowledged.

Please find below my contact info when you decide to offer your valuable suggestions. I am looking forward for a response.

Moreover, I would wish **if you inform your friends/students** about my efforts for Maths so that they may also be benefited.

Let's learn Maths with smile :-)

☞ For any clarification(s), please contact :

O.P. Gupta, Math Mentor

[*Maths (Hons.), E & C Engg., Indira Award Winner*]

Call or WhatsApp @ +91-9650 350 480 Mail us at : theopgupta@gmail.com

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