

# TRIGONOMETRIC EQUATIONS

## PREVIOUS EAMCET BITS

1. If  $3 \cos x \neq 2, \sin x$ , then the general solution of  $\sin^2 x - \cos 2x = 2 - \sin 2x$  is  $x =$

[EAMCET 2009]

1)  $n\pi + (-1)^n \frac{\pi}{2}, n \in \mathbb{Z}$

2)  $\frac{n\pi}{2}, n \in \mathbb{Z}$

3)  $(4n \pm 1) \frac{\pi}{2}, n \in \mathbb{Z}$

4)  $(2n - 1)\pi, n \in \mathbb{Z}$

Ans: 3

Sol.  $\sin^2 x - (1 - 2\sin^2 x) = 2 - 2\sin x \cos x$

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

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

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

$$\Rightarrow \cos x = 0 (\because 2\sin x \neq 3\cos x)$$

$$\Rightarrow x = (4n \pm 1)\pi/2, n \in \mathbb{Z}$$

2.  $\{x \in \mathbb{R} : \cos 2x + 2\cos^2 x - 2 = 0\} =$

[EAMCET 2008]

1)  $\left\{2n\pi + \frac{\pi}{3}; n \in \mathbb{Z}\right\}$  2)  $\left\{n\pi \pm \frac{\pi}{6}; n \in \mathbb{Z}\right\}$  3)  $\left\{n\pi \pm \frac{\pi}{3}; n \in \mathbb{Z}\right\}$  4)  $\left\{2n\pi - \frac{\pi}{3}; n \in \mathbb{Z}\right\}$

Ans: 2

Sol.  $\cos 2x + 2\cos^2 x - 2 = 0 \Rightarrow 2\cos^2 x - 1 + 2\cos^2 x - 2 = 0$

$$\Rightarrow 4\cos^2 x = 3 \Rightarrow \cos^2 x = \frac{3}{4} = \cos^2\left(\frac{\pi}{6}\right) \Rightarrow x = n\pi \pm \frac{\pi}{6}$$

3.  $\cos 2x = (\sqrt{2} + 1)\left(\cos x - \frac{1}{\sqrt{2}}\right), \cos x \neq \frac{1}{2} \Rightarrow x \in$

[EAMCET 2005]

1)  $\left\{2n\pi \pm \frac{\pi}{3}; n \in \mathbb{Z}\right\}$

2)  $\left\{2n\pi \pm \frac{\pi}{6}; n \in \mathbb{Z}\right\}$

3)  $\left\{2n\pi \pm \frac{\pi}{2}; n \in \mathbb{Z}\right\}$

4)  $\left\{2n\pi \pm \frac{\pi}{4}; n \in \mathbb{Z}\right\}$

Ans: 4

Sol.  $2\sqrt{2}\cos^2 x - (2 + \sqrt{2})\cos x + 1 = 0$

$$2\sqrt{2}\cos^2 x - 2\cos x - \sqrt{2}\cos x + 1 = 0$$

$$(2\cos x - 1)(\sqrt{2}\cos x - 1) = 0$$

$$\cos x \neq \frac{1}{2}; \quad \cos x = \frac{1}{\sqrt{2}}$$

$$\therefore x \in \left\{ 2n\pi \pm \frac{\pi}{4} / n \in \mathbb{Z} \right\}$$

4. The solution set of  $(5 + 4 \cos \theta)(2 \cos \theta + 1) = 0$  in the interval  $[0, 2\pi]$  is [EAMCET 2003]

- 1)  $\left\{ \frac{\pi}{3}, \frac{2\pi}{3} \right\}$       2)  $\left\{ \frac{2\pi}{3}, \frac{5\pi}{3} \right\}$       3)  $\left\{ \frac{2\pi}{3}, \frac{4\pi}{3} \right\}$       4)  $\left\{ \frac{2\pi}{3}, \frac{5\pi}{3} \right\}$

Ans: 3

Sol.  $(5 + 4 \cos \theta)(2 \cos \theta + 1) = 0$

$$\cos \theta = \frac{-1}{2} \Rightarrow \theta = \frac{2\pi}{3}, \frac{4\pi}{3}$$

5. The equation  $\sqrt{3} \sin x + \cos x = 4$  has [EAMCET 2001]

- 1) only one solution                                  2) two solutions  
3) infinitely many solutions                          4) no solutions

Ans: 4

Sol. The max. value of  $\sqrt{3} \sin x + \cos x$  is '2'.

$\therefore \sqrt{3} \sin x + \cos x$  never equal to '4'.

6. If  $\tan \theta + \sec \theta = \sqrt{3}$ , then the principal value of  $\theta + \frac{\pi}{6}$  is [EAMCET 2000]

- 1)  $\pi/4$                                   2)  $\pi/3$                                   3)  $2\pi/3$                                   4)  $3\pi/4$

Ans: 2

Sol.  $\tan \theta + \sec \theta = \sqrt{3}$

$$\sqrt{3} \cos \theta - \sin \theta = 1$$

$$\cos \left( \theta + \frac{\pi}{6} \right) = \frac{1}{2} \quad \therefore \left( \theta + \frac{\pi}{6} \right) = \frac{\pi}{3}$$

