

EE1030: Matrix Theory

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6. The number of distinct solutions of equation $\frac{5}{4}\cos^2 2x + \cos^4 x + \sin^4 x + \cos^6 x + \sin^6 x = 2$

in the interval $[0, 2\pi]$ is (JEE Adv. 2015)

7. Let a, b, c be three non-zero real numbers such that the equation:

$\sqrt{3}a\cos x + 2b\sin x = c, x \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$, has two distinct real roots α and β with $\alpha + \beta = \frac{\pi}{3}$. Then, the value of $\frac{b}{a}$ is _____.

(JEE Adv. 2018)

- (a) $(a - b)^2$ (b) $2\sqrt{a^2 + b^2}$
(c) $(a + b)^2$ (d) $2(a^2 + b^2)$

6. A line makes the same angle θ , with each of the x and z axis. If the angle β , which it makes with y-axis, is such that $\sin^2 \beta = 3\sin^2 \theta$, then $\cos^2 \theta$ equals [2004]

- (a) $\frac{2}{5}$ (b) $\frac{1}{5}$
(c) $\frac{3}{5}$ (d) $\frac{2}{3}$

Section-B JEE Main/AIEEE

1. The period of $\sin^2 \theta$ is [2002]

- (a) π^2 (b) π (c) 2π (d) $\pi/2$

2. The number of solution of $\tan x + \sec x = 2\cos x$ in $[0, 2\pi]$ is [2002]

- (a) 2 (b) 3 (c) 0 (d) 1

3. Which one is not periodic [2002]

- (a) $|\sin 3x| + \sin^2 x$ (b) $\cos \sqrt{x} + \cos^2 x$
(c) $\cos 4x + \tan^2 x$ (d) $\cos 2x + \sin x$

4. Let α, β be such that $\pi < \alpha - \beta < 3\pi$

If $\sin \alpha + \sin \beta = -\frac{21}{65}$ and $\cos \alpha + \cos \beta = -\frac{27}{65}$, then the value of $\cos \frac{\alpha - \beta}{2}$ [2004]

- (a) $-\frac{6}{65}$ (b) $\frac{3}{\sqrt{130}}$
(c) $\frac{6}{65}$ (d) $-\frac{3}{\sqrt{130}}$

5. If $u = \sqrt{a^2 \cos^2 \theta + b^2 \sin^2 \theta} + \sqrt{a^2 \sin^2 \theta + b^2 \cos^2 \theta}$ then the difference between the maximum and minimum values of u^2 is given by [2004]

7. The number of values of x in the interval $[0, 3\pi]$ satisfying the equation $2\sin^2 x + 5\sin x - 3 = 0$ is [2006]

- (a) 4 (b) 6 (c) 1 (d) 2

8. If $0 < x < \pi$ and $\cos x + \sin x = \frac{1}{2}$, then $\tan x$ is [2006]

- (a) $\frac{(1-\sqrt{7})}{4}$ (b) $\frac{(4-\sqrt{7})}{3}$
(c) $-\frac{(4+\sqrt{7})}{3}$ (d) $\frac{(1+\sqrt{7})}{4}$

9. Let **A** and **B** denote the statements

A: $\cos \alpha + \cos \beta + \cos \gamma = 0$

B: $\sin \alpha + \sin \beta + \sin \gamma = 0$

If $\cos(\beta - \gamma) + \cos(\gamma - \alpha) + \cos(\alpha - \beta) = -\frac{3}{2}$, then: [2009]

- (a) **A** is false and **B** is true
(b) both **A** and **B** are true
(c) both **A** and **B** are false
(d) **A** is true and **B** is false

10. Let $\cos(\alpha + \beta) = \frac{4}{5}$ and $\sin(\alpha - \beta) = \frac{5}{13}$, where $0 \leq \alpha, \beta \leq \frac{\pi}{4}$. Then $\tan 2\alpha =$ [2010]

- (a) $\frac{56}{33}$ (b) $\frac{19}{12}$ (c) $\frac{20}{7}$ (d) $\frac{25}{16}$

11. If $A = \sin^2 x + \cos^4 x$, Then for all real x :

[2010]

$$\begin{array}{ll} (a) \frac{13}{16} \leq A \leq 1 & (b) 1 \leq A \leq 2 \\ (c) \frac{3}{4} \leq A \leq \frac{13}{16} & (d) \frac{3}{4} \leq A \leq 1 \end{array}$$

12. In a ΔPQR , If $3\sin P + 4\cos Q = 6$ and $4\sin Q + 3\cos P = 1$, then the angle R is equal to:

[2012]

$$(a) \frac{5\pi}{6} \quad (b) \frac{\pi}{6} \quad (c) \frac{\pi}{4} \quad (d) \frac{3\pi}{4}$$

13. ABCD is a trapezium such that AB and CD are parallel and $BC \perp CD$. If $\angle ADB = \theta$, $BC = p$ and $CD = q$, then AB is equal to:

[JEEM2013]

$$\begin{array}{ll} (a) \frac{(p^2+q^2)\sin\theta}{p\cos\theta+q\sin\theta} & (b) \frac{p^2+q^2\cos\theta}{p\cos\theta+q\sin\theta} \\ (c) \frac{p^2+q^2}{p\cos^2\theta+q\sin^2\theta} & (d) \frac{(p^2+q^2)\sin\theta}{(p\cos\theta+q\sin\theta)^2} \end{array}$$