EE1030: Matrix Theory

EE24BTECH11006 - Arnav Mahishi

F. Match the Following

In these questions there are entries in columns 1 and 2. Each entry in column 1 is related to exactly one entry in column 2. Write the correct letter from column 2 against the entry number in column 1 in your answer book

1. $\frac{sin3\alpha}{cos2\alpha}$ *is* [1992-2 Marks]

Column I	**Column II**
(A) positive	(p) $\left(\frac{13\pi}{48}, \frac{14\pi}{48}\right)$
(B) negative	(q) $\left(\frac{14\pi}{48}, \frac{18\pi}{48}\right)$
	(r) $\left(\frac{18\pi}{48}, \frac{23\pi}{48}\right)$
	(s) $\left(0, \frac{\pi}{2}\right)$

2. Let $f(x) = sin(\pi cosx)$ and $g(x) = cos(2\pi sinx)$ be two functions defined for $x > 0$. Define the following sets whose elements are written in the increasing order. [JEE Adv. 2019]

$X = \{x : f(x) = 0\}, Y = \{x : f'(x) = 0\}$
$Z = \{x : g(x) = 0\}, W = \{x : g'(x) = 0\}$

Column I	**Column II**
(A) X	(p) $\supseteq \left\{\frac{\pi}{2}, \frac{3\pi}{2}, 4\pi, 7\pi\right\}$
(B) Y	(q)an arithmetic progression
(C) Z	(r)NOT an arithmetic progression
(D) W	(s) $\supseteq \left\{\frac{\pi}{6}, \frac{7\pi}{6}, \frac{13\pi}{6}\right\}$
	(t) $\supseteq \left\{\frac{\pi}{3}, \frac{2\pi}{3}, \pi\right\}$

Which of the following is the only CORRECT combination?

(a) (IV),(P),(R),(S) (b) (III),(P),(Q),(U)
(c) (III),(R),(U) (d) (IV),(Q),(T)

3. Let $f(x) = sin(\pi cosx)$ and $g(x) = cos(2\pi sinx)$ be two functions defined for $x > 0$. Define the following sets whose elements are written in the increasing order. [JEE Adv. 2019]

$X = \{x : f(x) = 0\}, Y = \{x : f'(x) = 0\}$
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Which of the following is the only CORRECT combination?

(a) (I),(Q),(U) (b) (I),(P),(R)
(c) (II),(R),(S) (d) (II),(Q),(T)

Paragraph 1

Let O be the origin, and $\overrightarrow{OX}, \overrightarrow{OY}, \overrightarrow{OZ}$ be three unit vectors in the directions of the sides $\overrightarrow{QR}, \overrightarrow{RP}, \overrightarrow{PQ}$ respectively, of a triangle PQR. [JEE Adv 2017]

1. $\left|\overrightarrow{OX} \times \overrightarrow{OY}\right| =$

(a) $sin(P + Q)$ (b) $sin2R$
(c) $sin(P + R)$ (d) $sin(Q + R)$

2. If the triangle PQR varies, then the minimum value of $cos(P+Q)+cos(Q+R)+cos(R+P)$ is.

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

(c) $\frac{3}{2}$ (d) $\frac{5}{3}$

I. Integer value type

1. The number of all possible values of θ where $0<\theta<\pi$ for which the system of equations

$$(y+Z)cos3\theta=(xyz)sin3\theta$$

$$xsin3\theta=\frac{2cos3\theta}{y}+\frac{2sin3\theta}{z}$$

$$(xyz)sin3\theta=(y+2z)cos3\theta+ysin3\theta$$

have a solution (x_o,y_o,x_o) with $y_oz_o\neq 0$, is [2010]

2. The number of all possible values of θ in the interval, $\left(\frac{-\pi}{2},\frac{\pi}{2}\right)$ such that $\theta\neq\frac{n\pi}{5}forn=0,\pm1,\pm2$ and $tan\theta=cot5\theta$ as well as $sin2\theta=cos4\theta$ is [2010]

3.The maximum value of the expression $\frac{1}{sin^2\theta+3sin\theta cos\theta+5cos^2\theta}$ is [2010]

4. Two parallel chords of a circle of radius 2 are at a distance$\left(\sqrt{3}+1\right)$ apart. If the chords subtend at the center, angles of $\frac{\pi}{k}and\frac{2\pi}{k}$, where $k>0$, the value of [k] is [2010]

5. The positive integer value of $n>3$ satisfying the equation $\frac{1}{sin\left(\frac{\pi}{n}\right)}=\frac{1}{sin\left(\frac{2\pi}{n}\right)}+\frac{1}{sin\left(\frac{3\pi}{n}\right)}$ is [2011]