2024-January Session-01-30-2024-shift-1

EE24BTECH11008-ASLIN GARVASIS

1) A line passing through the point $A(9,0)$ makes an angle of $30°$ with the positive direction of x-axis. If this line is rotated about A through an angle of $15°$ in the clockwise direction, then its equation in the new position is

   a) $\frac{y}{\sqrt{3}-2}+x=9$
   b) $\frac{x}{\sqrt{3}-2}+y=9$
   c) $\frac{x}{\sqrt{3}+2}+y=9$
   d) $\frac{y}{\sqrt{3}+2}+x=9$

2) Let S_a denote the sum of first n terms of an arithmetic progression. If $S_{20}=790$ and $S_{10}=145$, then $S_{15}-S_5$ is :

   a) 395
   b) 390
   c) 405
   d) 410

3) If $z=x+iy$, $xy\neq 0$, satisfies the equation $z^2+i\bar{z}=0$, then $\left|z^2\right|$ is equal to :

   a) 9
   b) 1
   c) 4
   d) $\frac{1}{4}$

4) Let $\overrightarrow{a}=a_1\hat{i}+a_2\hat{j}+a_3\hat{k}$ and $\overrightarrow{b}=b_1\hat{i}+b_2\hat{j}+b_3\hat{k}$ be two vectors such that $\left|\overrightarrow{a}=1\right|$; $\overrightarrow{a}\cdot\overrightarrow{b}=2$ and $|b|=4$. If $\overrightarrow{c}=2\left(\overrightarrow{a}\times\overrightarrow{b}\right)-3\overrightarrow{b}$, then the angle between $\overrightarrow{b}$ and $\overrightarrow{c}$ is equal to :

   a) $\cos^{-1}\left(\frac{2}{\sqrt{3}}\right)$
   b) $\cos^{-1}\left(\frac{-1}{\sqrt{3}}\right)$
   c) $\cos^{-1}\left(\frac{-\sqrt{3}}{2}\right)$
   d) $\cos^{-1}\left(\frac{2}{3}\right)$

5) The maximum area of a triangle whose one vertex is at $(0,0)$ and the other two vertices lie on the curve $y=-2x^2+54$ at points (x,y) and $(-x,y)$ where $y>0$ is :

   a) 88
   b) 122
   c) 92
   d) 108

6) The value of $\lim_{n\to\infty}\sum_{k=1}^{n}\frac{n^3}{\left(n^2+k^2\right)\left(n^2+3k^2\right)}$ is

   a) $\frac{\left(2\sqrt{3}+3\right)\pi}{24}$
   b) $\frac{13\pi}{8\left(4\sqrt{3}+3\right)}$
   c) $\frac{13\left(2\sqrt{3}-3\right)\pi}{8}$
   d) $\frac{\pi}{8\left(2\sqrt{3}+3\right)}$

7) Let $g:\mathbf{R}\to\mathbf{R}$ be a non constant twice differential such that $g\prime\left(\frac{1}{2}\right)=g\prime\left(\frac{3}{2}\right)$. If a real valued function f is defined as $f(x)=\frac{1}{2}\left(g(x)+g(2-x)\right)$, then

   a) $f\prime(x)=0$ for atleast two x in $(0,2)$
   b) $f\prime(x)=0$ for exactly one x in $(0,1)$
   c) $f\prime(x)=0$ for no x in $(0,1)$
   d) $f\prime\left(\frac{3}{2}\right)+f\prime\left(\frac{1}{2}\right)=1$

8) The area (in square units) of the region bounded by the parabola $y^2=4(x-2)$ and the line $y=2x-8$

   a) 8
   b) 9
   c) 6
   d) 7

9) Let $y=y(x)$ be the solution of the differential equation

   $$\sec x dy+\{2(1-x)\tan x+x(2-x)\}dx=0$$

   such that $y(0)=2$. Then $y(2)$ is equal to :

   a) 2
   b) $2\{1-\sin(2)\}$
   c) $2\{\sin(2)+1\}$
   d) 1

10) Let (α,β,γ) be the foot of perpendicular from the point $(1,2,3)$ on the line $\frac{x+3}{5}=\frac{y-1}{2}=\frac{z+4}{3}$, then $19(\alpha+\beta+\gamma)$ is equal to :

a) 102
b) 101
c) 99
d) 100

11) Two integers x and y are chosen with replacement from the set $\{0, 1, 2, 3, \ldots, 10\}$. Then the probability that $|x - y| > 5$ is :

a) $\frac{30}{121}$
b) $\frac{62}{121}$
c) $\frac{60}{121}$
d) $\frac{31}{121}$

12) If the domain of the function

$$f(x) = \cos^{-1}\left(\frac{2 - |x|}{4}\right) + \left(\log_e (3 - x)\right)^{-1}$$

is $[\alpha, \beta] - \{y, \beta\}$, then $\alpha + \beta + \gamma$ is equal to :

a) 12
b) 9
c) 11
d) 8

13) Consider the system of linear equation $x+y+z = 4\mu, x+2y+2\lambda z = 10\mu, x+33y+4\lambda^2 z = \mu^2 + 15$ where $\lambda, \mu \in \mathbf{R}$. Which one of the following statements is NOT correct ?

a) The system has unique solution if $\lambda \neq \frac{1}{2}$ and $\mu \neq 1, 15$
b) The system is inconsistent if $\lambda = \frac{1}{2}$ and $\mu \neq 1$
c) The system has infinite number of solutions if $\lambda = \frac{1}{2}$ and $\mu = 15$
d) The system is consistent if $\lambda \neq \frac{1}{2}$

14) If the circles $(x + 1)^2 + (y + 2)^2 = r^2$ and $x^2 + y^2 - 4x - 4y + 4 = 0$ intersect at exactly two distinct points, then

a) $5 < r < 9$
b) $0 < r < 7$
c) $3 < r < 7$
d) $\frac{1}{2} < r < 7$

15) If the lenght of the minor axis of ellipse is equal to half of the distance between the foci, then the eccentricity of the ellipse is :

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