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EE24BTECH11038 - MALAKALA BALA SUBRAHMANYA ARAVIND

1) Let $f(x) = \frac{x-1}{x+1}, x \in \mathbf{R} - \{0, -1, 1\}$. If $f^{n+1}(x) = f(f^n(x))$ for all $n \in \mathbf{N}$, then $f^6(6) + f^7(7)$ is equal to :
   a) $\frac{7}{6}$
   b) $-\frac{3}{2}$
   c) $\frac{7}{12}$
   d) $-\frac{11}{12}$

2) Let A=$\left\{z \in \mathbf{C} : \left|\frac{z+1}{z-1} < 1\right|\right\}$ and B=$\left\{z \in \mathbf{C} : arg\left(\frac{z-1}{z+1}\right) = \frac{2\pi}{3}\right\}$ then $A \cap B$ is
   a) a portion of circle centred at $\left(0, -\frac{1}{\sqrt{3}}\right)$ that lies in the second and third quadrants only
   b) a portion of circle centred at $\left(0, -\frac{1}{\sqrt{3}}\right)$ that lies in the second quadrant only
   c) an empty set
   d) a portion of circle of radius $\frac{2}{\sqrt{3}}$ that lies in the third quadrant only

3) Let A be a 3×3 invertible matrix. If $|adj(24A)| = |adj(3adj(2A))|$ then $|A|^2$ is equal to
   a) 6^6
   b) 2^{12}
   c) 2^6
   d) 1

4) The order pair (a, b), for which the system of linear equations

$$3x - 2y + z = b$$
$$5x - 8y + 9z = 3$$
$$2x + y + az = -1$$

   has no slolution is :
   a) $\left(3, \frac{1}{3}\right)$
   b) $\left(-3, \frac{1}{3}\right)$
   c) $\left(-3, -\frac{1}{3}\right)$
   d) $\left(3, -\frac{1}{3}\right)$

5) The remainder when $(2021)^{2023}$ is divided by 7 is :

a) 1
b) 5
c) 5
d) 6

6) $\lim_{x\to\frac{1}{\sqrt{2}}} \frac{\sin\left(\cos^{-1}x\right)-x}{1-\tan\left(\cos^{-1}x\right)}$ is equal to :

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

7) Let f,g:$\mathbf{R}\to\mathbf{R}$ be two real valued functions defined as

$$f(x)=\begin{cases}-|x+3|, & x<0\\ e^{x}, & x\geq 0\end{cases}$$

$$g(x)=\begin{cases}x^{2}+k_1x, & x<0\\ 4x+k_2, & x\geq 0\end{cases}$$

where k_1,k_2 are real constants. If (gof) is differentiable at x=0, then $(gof)(-4)+(gof)4$ is equal to :

a) $4\left(e^{4}+1\right)$
b) $2\left(2e^{4}+1\right)$
c) $4e^{4}$
d) $2\left(2e^{4}-1\right)$

8) The sum of absolute minimum and absolute maximum values of the function $f(x)=\left|3x-x^{2}+2\right|-x$ in the interval $[-1,2]$

a) $\frac{\sqrt{17}+3}{2}$
b) $\frac{\sqrt{17}+5}{2}$
c) 5
d) $\frac{9-\sqrt{17}}{2}$

9) Let S be set of all natural numbers , for which the line $\frac{x}{a}+\frac{y}{b}=2$ is a tangent to the curve $\left(\frac{x}{a}\right)^{n}+\left(\frac{y}{b}\right)^{n}=2$ at the point (a,b),ab≠0. Then:

a) $S=\phi$
b) $n(S)=1$
c) S={$2k:k\in\mathbf{N}$}
d) S=**N**

10) The area bounded by the curve y=$\left|x^2-9\right|$ and the line y=3 is :

a) $4\left(2\sqrt{3}+\sqrt{6}-4\right)$
b) $4\left(4\sqrt{3}+\sqrt{6}-4\right)$
c) $8\left(4\sqrt{3}+3\sqrt{6}-9\right)$
d) $4\left(4\sqrt{3}+\sqrt{6}-9\right)$

11) Let **R** be point $(3,7)$ and let **P** and **Q** be two points on the line x+y=5 such that PQR is an equilateral triangle. Then the area of$\triangle PQR$

a) $\frac{25}{4\sqrt{3}}$
b) $\frac{25\sqrt{3}}{2}$
c) $\frac{25}{\sqrt{3}}$
d) $\frac{25}{2\sqrt{3}}$

12) Let C be a circle passing through the points $\mathbf{A}(2,-1)$ and $\mathbf{B}(3,4)$. The line segment AB is not a diameter of C. If r is radius of C and its centre lies on the circle $(x-5)^2+(y-1)^2=\frac{13}{2}$, then r^2 is equal to:

a) 32
b) $\frac{65}{2}$
c) $\frac{61}{2}$
d) 30

13) Let the normal at the point **P** on the parabola $Y^2=6X$ pass through the point $(5,-8)$. If the tangent at **P** to the parabola intersects at its directrix at the point **Q** the the ordinate of point **Q**

a) -3
b) $-\frac{9}{4}$
c) $-\frac{5}{2}$
d) -2

14) if the two lines $l_1:\frac{x-2}{3}=\frac{y+1}{-2},z=2$ and $l_2:\frac{x-1}{1}=\frac{2y+3}{\alpha}=\frac{z+5}{2}$ are perpendicular then the angle between the lines l_2 and $l_3:\frac{1-x}{3}=\frac{2y-1}{-4}=\frac{z}{4}$ is :

a) $\cos^{-1}\frac{29}{4}$
b) $\sec^{-1}\frac{29}{4}$
c) $\cos^{-1}\frac{2}{29}$
d) $\cos^{-1}\frac{2}{\sqrt{29}}$

15) Let the plane 2x+3y+z+20=0 be rotated through a right angle about its line of intersection with the plane x-3y+5z=8. If the mirror image of the point $\left(2,-\frac{1}{2},2\right)$ in the rotated plane is $\mathbf{B}(a,b,c)$ then :

a) $\frac{a}{8}=\frac{b}{5}=\frac{c}{-4}$
b) $\frac{a}{4}=\frac{b}{5}=\frac{c}{-2}$
c) $\frac{a}{8}=\frac{b}{-5}=\frac{c}{4}$
d) $\frac{a}{8}=\frac{b}{5}=\frac{c}{2}$