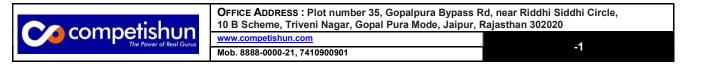
JEE-MAIN EXAM APRIL, 2024

Date: - 09-04-2024 (SHIFT-1)

MATHEMATICS

SECTION-A

1.	Let the line L intersect the lines $x - 2 = -y = z - 1$, $2(x + 1) = 2(y - 1) = z + 1$ and be parallel to the line								
	$\frac{x-2}{3} = \frac{y-1}{1} = \frac{z-2}{2}$. Then which of the following points lies on L ?								
	$(1)\left(-\frac{1}{3},1,1\right)$	(2) $\left(-\frac{1}{3}, 1, -1\right)$	$(3)\left(-\frac{1}{3},-1,-1\right)$	$(4)\left(-\frac{1}{3},-1,1\right)$					
2.	The parabola $y^2 = 4x$	$4x$ divides the area of the circle $x^2 + y^2 = 5$ in two parts. The area of the smaller part							
	is equal to :								
	$(1)\frac{2}{3} + 5\sin^{-1}\left(\frac{2}{\sqrt{5}}\right)$	$(2)\frac{1}{3} + 5\sin^{-1}\left(\frac{2}{\sqrt{5}}\right)$	$(3)\frac{1}{3} + \sqrt{5}\sin^{-1}\left(\frac{2}{\sqrt{5}}\right)$	$(4)\frac{2}{3} + \sqrt{5}\sin^{-1}\left(\frac{2}{\sqrt{5}}\right)$					
3.	The solution curve, of the differential equation $2y \frac{dy}{dx} + 3 = 5 \frac{dy}{dx}$, passing through the point (0,1) is a conic,								
	whose vertex lies on the line :								
	(1) $2x + 3y = 9$	(2) $2x + 3y = -9$	(3) $2x + 3y = -6$	(4) $2x + 3y = 6$					
4.	A ray of light coming from the point $P(1,2)$ gets reflected from the point Q on the x-axis and then passes								
	through the point $R(4,3)$). If the point $S(h, k)$ is s	uch that PQR <mark>S is</mark> a parall <mark>e</mark>	elogram, then hk² is equal to :					
	(1) 80	(2) 90	(3) 60	(4) 70					
5.	Let $\lambda, \mu \in R$. If the system	Let $\lambda, \mu \in R$. If the system of equations							
	$3x + 5y + \lambda z = 3$								
	7x + 11y - 9z = 2								
	$97x + 155y - 189z = \mu$								
		Itions, then $\mu + 2\lambda$ is equ	al to :						
	(1) 25	(2) 24	(3) 27	(4) 22					
6.	The coefficient of x^{70} in $x^2(1+x)^{98} + x^3(1+x)^{97} + x^4(1+x)^{96} + x^{54}(1+x)^{46}$ is ${}^{99}C_p - {}^{46}C_q$.								
	Then a possible value to $p + q$ is :								
	(1) 55	(2) 61	(3) 68	(4) 83					
7.	Let $\int \frac{2-\tan x}{3+\tan x} dx = \frac{1}{2} (\alpha x + \log_e \beta \sin x + \gamma \cos x) + C$, where C is the constant of integration. Then $\alpha + \frac{\gamma}{\beta}$ is								
	equal to :								
	(1) 3	(2) 1	(3) 4	(4) 7					
8.	A variable line L passe	s through the point (3,5)	and intersects the positiv	e coordinate axes at the points					
		area of the triangle OAB,	-						
	(1) 30	(2) 25	(3) 40	(4) 35					



9.	Let $ \cos\theta\cos(60-\theta)\cos(60-\theta) \le \frac{1}{8}, \theta \in [0,2\pi]$ Then, the sum of all $\theta \in [0,2\pi]$, where $\cos 3\theta$ attains its										
	maximum value, is :										
	(1) 9π	(2) 18π			(3) 67	τ			(4) 15π		
10.	Let $\overrightarrow{OA} = 2\overrightarrow{a}, \overrightarrow{OB} = 6\overrightarrow{a} + $	Let $\overrightarrow{OA} = 2\overrightarrow{a}, \overrightarrow{OB} = 6\overrightarrow{a} + 5\overrightarrow{b}$ and $\overrightarrow{OC} = 3\overrightarrow{b}$, where <i>O</i> is the origin. If the area of the parallelogram with adjacent									
	sides \overrightarrow{OA} and \overrightarrow{OC} is 15 sq. units, then the area (in sq. units) of the quadrilateral OABC is equal to :										
	(1) 38	(2) 40			(3) 32	2			(4) 35		
11.	If the domain of the function $f(x) = \sin^{-1}\left(\frac{x-1}{2x+3}\right)$ is $R - (\alpha, \beta)$ then $12\alpha\beta$ is equal to :										
	(1) 36	(2) 24			(3) 40)			(4) 32		
12.	If the sum of series $\frac{1}{1 \cdot (1)}$	$\frac{1}{(1+d)(1+2)}$	$\frac{1}{d}$ + ···	• + .	$\frac{1}{(1+9 d)(1+10 d)}$ is equal to 5				, then 50 d is equal to :		
	(1) 20	(2) 5			(3) 1	5			(4) 10		
13.	Let $f(x) = ax^3 + bx^2 + bx^$	<i>ex</i> + 41 be su	uch th	at <i>f</i> (1) = 40,	f'(1)	= 2 ar	nd $f''($	1) = 4. Then $a^2 + b^2 + c^2$ is		
	equal to :										
	(1) 62	(2) 73			(3) 54	ł			(4) 51		
14.									, y_c) be the point of intersection		
		1 and $(2 + c)x$	c + 5c	$y^{2}y = 1$	If h =	$= \lim_{c}$	$_{,1}x_c$ ar	nd <i>k</i> =	$\lim_{c\to 1} y_c$, then the equation of		
	the circle is :					2 -	2 .				
	(1) $25x^2 + 25y^2 - 20x$ (3) $25x^2 + 25y^2 - 2x + 25y^2 - 25y^2 - 2x + 25y^2 - 2$										
						-					
15.	The shortest distance I		-		-						
	$(1)\frac{187}{\sqrt{563}}$	(2) $\frac{178}{\sqrt{563}}$			$(3)\frac{18}{\sqrt{5}}$	85 63			(4) $\frac{179}{\sqrt{563}}$		
16.	The frequency distribut	ion of the age	of stu	udents	in a cl	ass of	40 stu	dents	<mark>is g</mark> iven below.		
		Age	15	16	17	18	19	20			
		No. of									
		Students	5	8	5	12	х	У			
									1		
	If the mean deviation a		an is ′	1.25 , 1		-	is equ	al to :			
	(1) 43	(2) 44		2. 25	(3) 47				(4) 46		
17.	The solution of the diffe										
40	$(1) x^2 - 4y^2 ^5 = x^2$		-		() !						
18.		-		-			-		a triangle such that $\vec{c} = \vec{a} - \vec{b}$.		
	and the area of the tria		α is a	positi			er, the	n c -			
40	(1) 16 Let $x \in C$ be the rests of	(2) 14	2	<u>/</u> 2	(3) 12			tio or	(4) 10 $x^4 + a^4$		
19.		the equation a	x + 2	$\sqrt{2x}$ –	1 = 0.	The d	luaura	uc equ	lation, whose roots are $\alpha^4 + \beta^4$		
	and $\frac{1}{10}(\alpha^{6}+\beta^{6})$, is :										
		(1) x2 - 190x + 9466 = 0 (2) x2 - 195x + 9466 = 0									
	(3) $x^2 - 195x + 9506 = 0$ (4) $x^2 - 180x + 9506 = 0$										
	(3) x = 195x + 9500 =	- 0			$(4) x^{-1}$	- 180	3x + 95	506 =	0		

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Let $f(x) = x^2 + 9$, $g(x) = \frac{x}{x + 9}$ and a = fog(10), b = gof(3). If e and 1 denote the eccentricity and the length 20. of the latus rectum of the ellipse $\frac{x^2}{a} + \frac{y^2}{b} = 1$, then $8e^2 + 1^2$ is equal to. (2) 8(3) 6 (4) 12 (1) 16

SECTION-B

- 21. Let a, b and c denote the outcome of three independent rolls of a fair tetrahedral die, whose four faces are marked 1,2,3,4. If the probability that $ax^2 + bx + c = 0$ has all real roots is $\frac{m}{n}$, gcd(m, n) = 1, then m + n is equal to
- 22. The sum of the square of the modulus of the elements in the set $\{z = a + ib: a, b \in Z, z \in C, |z - 1| \le 1, |z - 1| \le 1,$ $5| \le |z - 5i|$ is
- 23. Let the set of all positive values of λ , for which the point of local minimum of the function $(1 + x(\lambda^2 - x^2))$ satisfies $\frac{x^2+x+2}{x^2+5x+6} < 0$, be (α, β) . Then $\alpha^2 + \beta^2$ is equal to
- 24. Let

$$\lim_{n \to \infty} \left(\frac{n}{\sqrt{n^4 + 1}} - \frac{2n}{(n^2 + 1)\sqrt{n^4 + 1}} + \frac{n}{\sqrt{n^4 + 16}} - \frac{8n}{(n^2 + 4)\sqrt{n^4 + 16}} + \dots + \frac{n}{\sqrt{n^4 + n^4}} - \frac{2n \cdot n^2}{(n^2 + n^2)\sqrt{n^4 + n^4}} \right) \text{ be } \frac{\pi}{k},$$

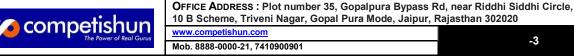
using only the principal values of the inverse trigonometric functions. Then k^2 is equal to

- The remainder when 428^{2024} is divided by 21 is 25.
- 26. Lef f: $(0, \pi) \rightarrow R$ be a function given by

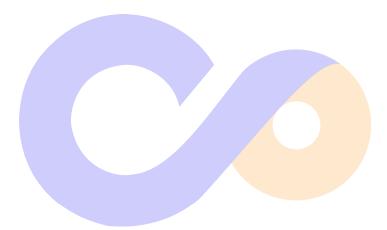
$$f(x) = \begin{cases} \left(\frac{8}{7}\right)^{\frac{\tan 8x}{\tan 7x}}, & 0 < x < \frac{\pi}{2} \\ a - 8, & x = \frac{\pi}{2} \\ (1 + |\cot x|)^{\frac{b}{a}|\tan x|}, & \frac{\pi}{2} < x < \pi \end{cases}$$

Where a, b \in Z. If f is continuous at $x = \frac{\pi}{2}$, then $a^2 + b^2$ is equal to

- Let A be a non-singular matrix of order 3. If det($3adj(2adj((det A)A))) = 3^{-13} \cdot 2^{-1}$ and det (3adj(2A)) = 27. $2^{m} \cdot 3^{n}$, then |3 m + 2n| is equal to
- Let the centre of a circle, passing through the point (0,0), (1,0) and touching the circle $x^2 + y^2 = 9$, be 28. (h, k). Then for all possible values of the coordinates of the centre (h, k), $4(h^2 + k^2)$ is equal to
- If a function f satisfies f(m + n) = f(m) + f(n) for all m, n \in N and f(1) = 1, then the largest natural 29. number λ such that $\sum_{k=1}^{2022} f(\lambda + k) \le (2022)^2$ is equal to
- Let A = {2,3,6,7} and B = {4,5,6,8}. Let R be a relation defined on $A \times B$ by $(a_1, b_1)R(a_2, b_2)$ is and only if 30. $a_1 + a_2 = b_1 + b_2$. Then the number of elements in R is



NTA ANSWER									
1.	(2)	2.	(1)	3.	(1)	4.	(4)	5.	(1)
6.	(4)	7.	(3)	8.	(1)	9.	(3)	10.	(4)
11.	(4)	12.	(2)	13.	(4)	14.	(1)	15.	(1)
16.	(2)	17.	(1)	18.	(2)	19.	(3)	20.	(2)
21.	(19)	22.	(9)	23.	(39)	24.	(32)	25.	(1)
26.	(81)	27.	(14)	28.	(9)	29.	(1010)	30.	(25)





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