MOMENTUM

MATHEMATICS

(24 Feb 2021) Shift-2

1. Find the value of ${}^{n+1}C_2 + 2\,({}^2C_2 + {}^3C_2 + \ldots\ldots + {}^nC_2) = ?$

(1) $\frac{n(n+1)(2n-1)}{6}$ (2) $\frac{n(n+1)(2n+1)}{6}$ (3) $\frac{(n-1)n(n+1)}{6}$ (4) $\frac{n(n+1)}{2}$

2. If A and B are subset s of X= {1,2,3,4,5} then find the probability such that $n(A \cap B) = 2$

(1) $\frac{65}{2^7}$ (2) $\frac{65}{2^9}$ (3) $\frac{35}{2^9}$ (4) $\frac{135}{2^9}$

3. Given $f(0) = 1, f(2) = e^2$ also $f'(x) = f'(2-x)$, then the value of $\int_0^2 f(x)dx$ is

(1) $1-e^2$ (2) $1+e^2$ (3) e (4) e^2

4. A curve y=f(x) passing through the point (1, 2) satisfies the differential equation $x\frac{dy}{dx} + y = bx^4$ such that $\int_1^2 f(y)dy = \frac{62}{5}$. The value of b is

(1) 10 (2) 11 (3) $\frac{32}{2}$ (4) $\frac{62}{5}$

5. The area of the region defined by $5x^2 \le y \le 2x^2 + 9$ is

(1) $6\sqrt{3}$ (2) $12\sqrt{3}$ (3) $18\sqrt{3}$ (4) $9\sqrt{3}$

6. A aeroplane is flying horizontally with sped of 432 km/hr at height h meter from ground its angle of elevation from a point on ground is 60^0. After 20 sec its angle of elevation from same point is 30^0 then the 'h' is equal to

(1) $1200\sqrt{3}$ (2) $600\sqrt{3}$ (4) $1800\sqrt{3}$ (4) $1000\sqrt{3}$

7. A curve $y = ax^2 + bx + c$ passing through the point (1, 2) has slope at origin equal to 1 then ordered triplet (a,b,c) may be

(1) (1, 1 0) (2) $\left(\frac{1}{2}, 1, 0\right)$ (3) $\left(-\frac{1}{2}, 1, 1\right)$ (4))2,–1, 0)

8. The value of $\tan\left(\frac{1}{4}\sin^{-1}\frac{\sqrt{63}}{8}\right)$ is

(1) $\frac{1}{\sqrt{7}}$ (2) $\frac{1}{\sqrt{5}}$ (3) $\frac{2}{\sqrt{3}}$ (4) None of these

9. The value of $\int_1^3 [x^2 - 2x - 2]\,dx$ ([.] denotes greatest integers function)

(1) /04 (2) –5 (3) $-1-\sqrt{2}-\sqrt{3}$ (4) $1-\sqrt{2}-\sqrt{3}$

10. Which of the following conic has tangent '$x + \sqrt{3}y - 2\sqrt{3}$' at point $\left(\frac{3\sqrt{3}}{2}, \frac{1}{2}\right)$?

(1) $x^2 + 9y^2 = 9$ (2) $y^2 = \frac{x}{6\sqrt{3}}$ (3) $x^2 - 9y^2 = 10$ (4) $x^2 = \frac{y}{6\sqrt{3}}$

11. The negation of the statement $\sim p \wedge (p \vee q)$ is

(1) $p \wedge \sim q$ (2) $p \vee \sim q$ (3) $\sim p \wedge q$ (4) $\sim p \vee \sim q$

12. Equation of plane thorugh (1, 0, 2) and line of intersection of planes $\vec{r} \cdot (\hat{i} + \hat{j} + \hat{k}) = 1$ and $\vec{r} \cdot (\hat{i} - 2\hat{j}) = -2$ is

(1) $\vec{r} \cdot (\hat{i} + 7\hat{j} + 3\hat{k}) = 7$ (2) $\vec{r} \cdot (3\hat{i} + 10\hat{j} + 3\hat{k}) = 7$

(3) $\vec{r} \cdot (\hat{i} + \hat{j} - 3\hat{k}) = 4$ (4) $\vec{r} \cdot (\hat{i} + 4\hat{j} - \hat{k}) = -7$

13. A is 3 x 3 square matrix and B is 3 x 3 skew symmetric matrix and X is a 3 x 1 matrix, then equation $(A^2B^2 - B^2A^2)\,X = 0$ (Where O is a null matrix) has/have

(1) Infinite solution (2) No solution

(3) Exactly one solution (4) Exactly two solution

14. If $\begin{vmatrix} f(x) & f'(x) \\ f'(x) & f''(x) \end{vmatrix} = 0$, $f(0) = 1$ and $f'(0) = 2$

(1) [6, 9] (2) [9, 12] (3) [8, 10] (4) [5, 7]

15. Find a point on the curve $y = x^2 + 4$ which is at shortest distance from the line $y = 4x - 1$.

(1) (2, 8) (2) (1, 5) (3) (3, 13) (4) (–15)

16. Let $= \begin{cases} -55x & ; \quad x < -5 \\ 2x^3 - 3x^2 - 120x & ; \quad -5 \le x < 4 \\ 2x^3 - 3x^2 - 36x + 10 & ; \quad x \ge 4 \end{cases}$.

Then interval in which f(x) is monotonically increasing is

(1) $(-5, -4) \cup (4, \infty)$ (2) $(-\infty, -4) \cup (5, \infty)$

(3) $(-5, 4) \cup (5, \infty)$ (4) $(-5, -4) \cup (3, \infty)$

17. If a, b, c are in A.P. & centroid of the triangle with vertices $(a, c), (a, b), (2, b)$ is $\left(\frac{10}{3}, \frac{7}{3}\right)$ and α, β are roots of the equation $ax^2 + bx + 1 = 0$, then $\alpha^2 + \beta^2 - \alpha\beta$

(1) $-\frac{71}{256}$ (2) $\frac{71}{256}$ (3) $\frac{69}{256}$ (4) $-\frac{69}{256}$

18. Given $a + \alpha = 1, b + \beta = 2$ and $\alpha f(x) + \alpha f\left(\frac{1}{x}\right) = bx + \frac{\beta}{x}$ then value of $\frac{f(x) + f\left(\frac{1}{x}\right)}{x + \frac{1}{x}}$

19. Find the maximum value of 'k' for which the maximum value of variance of 10 elements is 10 in which 9 values are 1 and one value of is k. (Where k is integer)

20. Distance of p (x,y) from (5, 0) is thrice as distance of P(x,y) from (–5, 0). If locus of P is circle with radius 'r' then final the value of $4r^2$.

21. Four numbers whose sum is $\frac{65}{12}$ are in G.P. Sum of their reciprocals is $\frac{65}{18}$ and product of first three of them is 1. If third term is α then find value of 2α.

22. Three are 10 students $S_1, S_2 \ldots\ldots\ldots S_{10}$. Find the number of ways to form 3 groups G_1, G_2, G_3 such that all gorups has at least 1 member and group G_3 has almost 3 memebers.

23. At point P (5, 7) on circle $P(5, 7)$ on circle $(x - 2)^2 + (y - 3)^2 = 25$ a tangent and a normal is drawn. The area of triangle formed by this tangent normal with x axis is λ then 24λ is.