

Topics : Sequence & Series, Application of Derivatives, Limits, Continuity & Derivability

Type of Questions

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|---|--------------------------|-------------------|
| Single choice Objective (no negative marking) Q. 1,2,3,4,5 | (3 marks, 3 min.) | M.M., Min. |
| Subjective Questions (no negative marking) Q. 6,7,8 | (4 marks, 5 min.) | [15, 15] |
| | | [12, 15] |

1. If a, b, c, d, e are five positive numbers, then

- (A) $\left(\frac{a}{b} + \frac{b}{c}\right)\left(\frac{c}{d} + \frac{d}{e}\right) \geq 4\sqrt{\frac{a}{e}}$ (B) $\frac{b}{a} + \frac{c}{b} + \frac{d}{c} + \frac{e}{d} + \frac{a}{e} \geq \frac{1}{5}$
- (C) $\frac{a}{b} + \frac{b}{c} + \frac{c}{d} + \frac{d}{e} + \frac{e}{a} < 5$ (D) None of these

2. Set of all possible values of a such that $f(x) = e^{2x} - (a + 1)e^x + 2x$ is monotonically increasing for all $x \in \mathbb{R}$, is

- (A) (3, 4) (B) $(-\infty, 0)$ (C) $(-\infty, 3]$ (D) (3, ∞)

3. If at each point of the curve $y = x^3 - ax^2 + x + 1$, tangent is inclined at an acute angle with the positive direction of the x-axis then

- (A) $a > 0$ (B) $a \leq \sqrt{3}$ (C) $-\sqrt{3} < a < \sqrt{3}$ (D) none of these

4. If $f(x)$ is differentiable for all $x \in \mathbb{R}$ so that $f(2) = 4$ and $f'(x) \geq 5$ for all $x \in [2, 6]$, then $f(6)$

- (A) ≥ 24 (B) ≤ 24 (C) ≥ 9 (D) none of these

5. Let $U_n = \frac{n!}{(n+2)!}$ where $n \in \mathbb{N}$. If $S_n = \sum_{n=1}^n U_n$, then $\lim_{n \rightarrow \infty} S_n$ equals

- (A) 2 (B) 1 (C) $\frac{1}{2}$ (D) non existent

6. If the equation $x^2 e^x = k$ possess three real roots then the range of values of k is _____

7. Find value of a, b, c such that curves $y = x^2 + ax + b$ and $y = cx - x^2$ will touch each other at the point (1, 0).

8. If $f(x)$ and $g(x)$ are continuous functions in $[a, b]$ and they are differentiable in (a, b) then prove that

$$\begin{vmatrix} f(a) & f(b) \\ g(a) & g(b) \end{vmatrix} = (b - a) \begin{vmatrix} f(a) & f'(c) \\ g(a) & g'(c) \end{vmatrix} \text{ where } a < c < b.$$



Answers Key

1. (A) 2. (C) 3. (C) 4. (A)
5. (C) 6. $k \in (0, 4e^{-2})$ 7. $a = -3, b = 2, c = 1$