

Topics : Complex Number, Continuity & Derivability, Application of Derivatives, Sequence & Series

Type of Questions

M.M., Min.

Single choice Objective (no negative marking) Q.1,2,3,4	(3 marks, 3 min.)	[12, 12]
Subjective Questions (no negative marking) Q.5,6,7,8	(4 marks, 5 min.)	[16, 20]

1. The angle at which the curve $y = 2 e^{2x}$ intersects the y-axis is
 (A) $\tan^{-1} 4$ (B) $\cot^{-1} 4$ (C) $\tan^{-1} 2$ (D) $\cot^{-1} 2$
2. The subnormal at any point on the curve $xy^n = a^{n+1}$ is constant for:
 (A) $n = 0$ (B) $n = 1$ (C) $n = -2$ (D) no value of n
3. Let the sequence $a_1, a_2, a_3, \dots, a_{2n-1}, a_{2n}$ form an A.P. Then the value of,

$$a_1^2 - a_2^2 + a_3^2 - \dots + a_{2n-1}^2 - a_{2n}^2$$
 is :
 (A) $\frac{2n}{n-1} (a_{2n}^2 - a_1^2)$ (B) $\frac{n}{2n-1} (a_1^2 - a_{2n}^2)$
 (C) $\frac{n}{n+1} (a_1^2 + a_{2n}^2)$ (D) $\frac{n}{n-1} (a_1^2 + a_{2n}^2)$
4. Let $f(x) = \max. \{ |x^2 - 2| |x|, |x| \}$ and $g(x) = \min. \{ |x^2 - 2| |x|, |x| \}$, then
 (A) both $f(x)$ and $g(x)$ are non differentiable at 5 points.
 (B) $f(x)$ is not differentiable at 5 points and $g(x)$ is non differentiable at 7 points.
 (C) number of points of non differentiability for $f(x)$ and $g(x)$ are 7 and 5 respectively.
 (D) both $f(x)$ and $g(x)$ are non differentiable at 3 and 5 points respectively.
5. If $f(x) = \frac{2}{\sqrt{3}} \tan^{-1} \left(\frac{2x+1}{\sqrt{3}} \right) - \ell \ln (x^2 + x + 1) + (k^2 - 5k + 3)x + 10$ is a decreasing function for all $x \in \mathbb{R}$,
 find the permissible values of k .
6. Using monotonicity find range of the function $f(x) = \sqrt{x-1} + \sqrt{6-x}$.
7. The centre of a square is at the point with complex number $z_0 = 1 + i$ and one of its vertices is at the points $z_1 = 1 - i$. The complex numbers which correspond to the other vertices are _____, _____ & _____.
8. Find the length of arc given by $\text{Arg} \left(\frac{z-1}{z+2i} \right) = \pi/3$

Answers Key

1. (B) 2. (C) 3. (B) 4. (B)

5. $k \in \left[\frac{5 - \sqrt{5}}{2}, \frac{5 + \sqrt{5}}{2} \right]$ 6. $[\sqrt{5}, \sqrt{10}]$

7. $-1 + i, 1 + 3i, 3 + i$ 8. $\frac{\sqrt{5}}{\sqrt{3}} \cdot \frac{4\pi}{3}$