MATHEMATICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 39

Total Marks : 25

Max. Time : 26 min.

Topics : **Application of Derivatives, Solution of Triangle**

Type of Questions		M.M., Min.
Comprehension (no negative marking) Q.1 to Q.3	(3 marks, 3 min.)	[9, 9]
Single choice Objective (no negative marking) Q. 4,5,6,7	(3 marks, 3 min.)	[12, 12]
Subjective Questions (no negative marking) Q.8	(4 marks, 5 min.)	[4, 5]

COMPREHENSION (Q. NO. 1 TO 3)

Let f(x) be a function such that it is thrice differentiable in (a, b). Consider a function

$\phi(x) = f(b) - f(x) - (b - x) f'(x) - \frac{(b-x)^2}{2} f''(x) - (b - x)^3 \lambda$. and $\phi(x)$ follows all conditions of Rolle's theorem on [a, b]

1. If there exist some number $c \in (a, b)$ such that $\phi'(c) = 0$ and $f(b) = f(a) + (b - a) f'(a) + \frac{(b-a)^2}{2} f''(a) + \mu (b - a)^3 f'''(c)$, then μ is

(A) $\frac{1}{2}$ (B) $\frac{1}{6}$ (C) $\frac{1}{8}$ (D) $-\frac{1}{2}$

2. Let $f(x) = x^4 - 6x^3 + 12x^2 - 8x + 3$. If Rolle's theorem is applicable to $\phi(x)$ on [2, 2 + h] and there exist $c \in (2, 2 + h)$ such that $\phi'(c) = 0$ and $\frac{f(2+h)-f(2)}{h^3} = g(c)$, then slope of tangent of curve y = g(x) at x = 5 is

(A) 4 (B) 5 (C) 6 (D) 10

3. Let $f(x) = e^{2x}$ and b = a + h. If there exists a real number $\theta \in (0, 1)$ such that $\phi(a + \theta h) = 0$ and $\frac{e^{2h} - 1 - 2h - 2h^2}{h^3} = Ae^{B\theta h}$, then the value of $\frac{2B}{A}$ is equal to

(A) 4 (B) 3 (C) 6 (D) 8

4. The curve $y = x^3 + x^2 - x$ has two horizontal tangents. The distance between these two horizontal lines, is

(A) $\frac{13}{9}$ (B) $\frac{11}{9}$ (C) $\frac{22}{27}$ (D) $\frac{32}{27}$

5. If a, b > 0, then minimum value of $y = \frac{b^2}{a-x} + \frac{a^2}{x}$ in (0, a) is

(A) $\frac{a+b}{a}$ (B) $\frac{ab}{a+b}$ (C) $\frac{1}{a}+\frac{1}{b}$ (D) none of these

6. Find maximum possible area that can be enclosed by a wire of length 20 cm by bending it in form of a circular sector.

(A) 10 (B) 25 (C) 30 (D) 20

7. If the sides a, b, c of a triangle ABC are the roots of the equation $x^3 - 13x^2 + 54x - 72 = 0$, then the value of

$\frac{\cos A}{a} + \frac{\cos B}{b} + \frac{\cos C}{c}$ is equal to (with usual notation in ΔABC)

(A) $\frac{169}{144}$ (B) $\frac{61}{72}$ (C) $\frac{61}{144}$ (D) $\frac{169}{72}$

8. If $x = e^t \sin t$, $y = e^t \cos t$, show that $\frac{d^2y}{dx^2} = \frac{-2(x^2+y^2)}{(x+y)^3}$

Answers Key

1. (B)	**2.** (A)	**3.** (B)	**4.** (D)
5. (D)	**6.** (B)	**7.** (C)	