MATHEMATICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 26

Total Marks : 27

Max. Time : 30 min.

Topics : Method of Differentiation, Straight Line, Continuity & Derivability, Circle

Type of Questions		**M.M., Min.**
Comprehension (no negative marking) Q.1 to Q.2	**(3 marks, 3 min.)**	**[6, 6]**
Single choice Objective (no negative marking) Q.3,4,5	**(3 marks, 3 min.)**	**[9, 9]**
Subjective Questions (no negative marking) Q.6,7,8	**(4 marks, 5 min.)**	**[12, 15]**

COMPREHENSION (1 - 2)

In calculus the derivative of any function y = f(x) is defined as

$$D\,f(x) = \lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$$

Now instead of this usual definition of derivative Df(x), define a new kind of derivative D*f(x), which can be calculated by the formula

$$D^*\,f(x) = \lim_{h\to 0}\frac{f^2(x+h)-f^2(x)}{h}$$

where $f^2(x) = (f(x))^2$.

1. If $f(x) = \frac{x}{\ell nx}$, then D* f(x) is

(A) $\frac{\ell nx-1}{(\ell nx)^2}$ (B) $\frac{2x(\ell nx-1)}{(\ell nx)}$ (C) $\frac{2x(\ell nx-1)}{(\ell nx)^2}$ (D) $\frac{2x(\ell nx-1)}{(\ell nx)^3}$

2. If function $g(x) = x^x$, then $D^* g(x)|_{x=1}$ is

(A) 1 (B) $2e^e$ (C) 2 (D) not defined

3. The point ([P + 1], [P]) lies inside the circle $x^2 + y^2 - 2x - 15 = 0$, then set of all values of P is (where [.] represents greatest integer function)

(A) [–2, 3) (B) (–2, 3) (C) [–2, 0) ∪ (0, 3) (D) [0, 3)

4. The line L given by $\frac{x}{5}+\frac{y}{b} = 1$ passes through the point (13, 32). The line K is parallel to L and has the equation $\frac{x}{c}+\frac{y}{3} = 1$. Then the distance between L and K is

(A) $\sqrt{17}$ (B) $\frac{17}{\sqrt{15}}$ (C) $\frac{23}{\sqrt{17}}$ (D) $\frac{23}{\sqrt{15}}$

5. If the normal to differentiable curve y = f(x) at x = 0 be given by the equation 3x – y + 3 = 0, then the value of $\lim_{x\to 0} \frac{x^2}{f(x^2)-5f(4x^2)+4f(7x^2)}$ is

(A) 1/3

(B) – 1/3

(C) – 1/5

(D) 1/4

6. A triangle has two of its sides along the lines $y = m_1 x$ & $y = m_2 x$, where m_1 , m_2 are the roots of the equation $3x^2 + 10x + 1 = 0$. If H (6 , 2) be the orthocentre of the triangle, find the equation of the third side of the triangle.

7. f(x) is defined as under : $f(x) = \begin{cases} ax(x-1)+b & ; \quad x<1 \\ x-1 & ; \quad 1\le x\le 3 \\ cx^2+dx+2 & ; \quad x>3 \end{cases}$

Determine the constants a, b, c and d, given that

(i) f(x) is continuous for all x

(ii) f '(1) does not exist

(iii) f '(x) is continuous at x = 3

8. Let f(x) be a function of x defined as $f(x) = \begin{cases} \frac{x^2-1}{x^2-2|x-1|-1} & , \quad x\neq 1 \\ \frac{1}{2} & , \quad x=1 \end{cases}$

Discuss the continuity of function at x = 1.

Answers Key

1. (D) **2.** (C) **3.** (A) **4.** (C)

5. (B) **6.** $3x + y + 1 = 0$

7. $a \neq 1, b = 0, c = 1/3, d = -1$