MATHEMATICS



DPP No. 25

Total Marks: 27

Max. Time: 28 min.

Limits, Straight Line, Continuity & Derivability Topics:

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	(3 marks, 3 min.)	[6,	6]
Multiple choice objective (no negative marking) Q.5	(5 marks, 4 min.)	[5,	4]
True or False (no negative marking) Q.6	(2 marks, 2 min.)	[2,	2]
Subjective Questions (no negative marking) Q.7,8	(4 marks, 5 min.)	[8,	10]

COMPREHENSION (FOR Q.NO. 1 TO 2)

If $f(x) = maximum \left(\cos x, \frac{1}{2}, \{ \sin x \} \right)$, $0 \le x \le 2\pi$, where $\{ . \}$ represents fractional part function, then

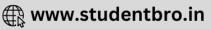
- 1. Number of points of discontinuity of f(x) is
- (B) 2
- (C)3
- (D) 4
- 2. Number of points where f(x) is not differentiable is
 - (A) 4
- (B) 5
- (C) 6
- (D) 7
- Consider a function $f(x): R \to R$ and if $\lim_{x \to a} [f(x)]$ does not exist, where [] denotes greatest integer 3. function, then
 - (A) $\lim_{x\to a} f(x)$ will never exist
- (B) f(x) may be continuous at x = a
- (C) Function will not have a tangent at x = a (D) None of these
- The angle between straight lines joining the origin and intersection points of the straight line bx + ay = ab 4. and circle $x^2 + y^2 = ax + by$ is
 - (A) $\frac{\pi}{3}$
- (B) $\frac{\pi}{4}$
- (C) $\frac{\pi}{6}$
- (D) $\frac{\pi}{2}$
- 5. Two consecutive vertices of a rectangle of area 10 unit² are (1,3) and (-2, -1). Other two vertices are
 - (A) $\left(\frac{-3}{5}, \frac{21}{5}\right), \left(-\frac{18}{5}, \frac{1}{5}\right)$

(B) $\left(-\frac{3}{5}, \frac{21}{5}\right), \left(-\frac{2}{5}, -\frac{11}{5}\right)$

(C) $\left(-\frac{2}{5}, -\frac{11}{5}\right), \left(\frac{13}{5}, \frac{9}{5}\right)$

(D) $\left(\frac{13}{5}, \frac{9}{5}\right), \left(-\frac{18}{5}, \frac{1}{5}\right)$





6. True / False

(A)
$$\lim_{x \to \infty} \frac{\ell nx}{[x]} = \lim_{x \to \infty} \frac{\{x\}}{\ell nx}$$

where [.] is G.I.F. & { . } denotes fractional part function

(B) If
$$\lim_{x \to \infty} \left(\sqrt{x^4 + ax^3 + 3x^2 + bx + 2} - \sqrt{x^4 + 2x^3 - cx^2 + 3x - d} \right) = 4$$
,

then absolute value of a - c is 3.

(C)
$$\lim_{x\to 0} \left[\frac{\sin(\text{sgn}(x))}{\text{sgn}(x)} \right] = 1 \text{ where } [.] \text{ is greatest integer function}$$

(D)
$$\lim_{x \to \infty} \sec^{-1} \left(\frac{x}{\sin x} \right) = \lim_{x \to \infty} \sec^{-1} \left(\frac{\sin x}{x} \right)$$

7. Consider the function
$$g(x) = \begin{cases} \frac{1-a^x + xa^x \ell na}{a^x x^2} & \text{; } x < 0 \\ \frac{2^x a^x - x \ell n2 - x \ell na - 1}{x^2} & \text{; } x > 0 \end{cases}$$
 where $a > 0$. Find the value of a and $g(0)$ so

that the function g(x) is continuous at x = 0.

8. Consider the function
$$f(x) = \begin{cases} x^2 \left| \cos \frac{\pi}{2x} \right| & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$$
. Find LHD and RHD at $x = \frac{1}{3}$



Answers Key

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

5. (A)(C)

6. (A) True (B) True (C) False (D) False

7. $a = \frac{1}{\sqrt{2}}$, $g(0) = \frac{1}{8} (\ell n 2)^2$ 8. LHD= $-\frac{\pi}{2}$ and RHD= $\frac{\pi}{2}$

