MATHEMATICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 25

Total Marks : 27

Max. Time : 28 min.

Topics : Limits, Straight Line, Continuity & Derivability

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

(A) 1 (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

3. Consider a function f(x) : R → R and if $\lim_{x \to a}$ [f(x)] does not exist, where [ ] denotes greatest integer 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

4. The angle between straight lines joining the origin and intersection points of the straight line bx + ay = ab 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) $\lim\limits_{x\to\infty} \dfrac{\ell nx}{[x]} = \lim\limits_{x\to\infty} \dfrac{\{x\}}{\ell n x}$

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

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

then absolute value of a – c is 3.

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

(D) $\lim\limits_{x\to\infty} \sec^{-1}\left(\dfrac{x}{\sin x}\right) = \lim\limits_{x\to\infty} \sec^{-1}\left(\dfrac{\sin x}{x}\right)$

7. Consider the function g(x) = $\begin{cases} \dfrac{1-a^x+xa^x\ell na}{a^x x^2} & ; x<0 \\ \dfrac{2^x a^x - x\ell n2 - x\ell na - 1}{x^2} & ; x>0 \end{cases}$ 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) = $\begin{cases} x^2\left|\cos\dfrac{\pi}{2x}\right| & \text{if} \quad x \neq 0 \\ 0 & \text{if} \quad x = 0 \end{cases}$. Find LHD and RHD at x = $\dfrac{1}{3}$

Answers Key

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

5. (A)(C)

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

7. $a=\frac{1}{\sqrt{2}}$, $g(0)=\frac{1}{8}(\ell n2)^2$ **8.** LHD$=-\frac{\pi}{2}$ and RHD$=\frac{\pi}{2}$