Mains - 11.A

ai24btech11030 - Shiven Bajpai

Section - A

1) Let $f(x) = \begin{cases} (x-1)^2 \sin \frac{1}{x-1} |x| & \text{if } x \neq 1 \\ -1 & \text{if } x = 1 \end{cases}$ be a real-valued function. Then the set of points where f(x) is not differentiable is ... (1981 - 2 Marks)

2) Let $f(x) = \begin{cases} \frac{x^3+x^2-16x+20}{(x-2)^2} & \text{if } x \neq 2 \\ k & \text{if } x = 2 \end{cases}$
If f(x) is continuous for all x, then k= ... (1981 - 2 Marks)

3) A discontinuous function $y = f(x)$ satisfying $x^2 + y^2 = 4$ is given by $f(x) = \ldots$ (1982 - 2 Marks)

4) $\lim_{x\to 1}(1-x)\tan\frac{\pi x}{2} = \ldots$ (1984 - 2 Marks)

5) If $f(x) = \begin{cases} \sin x, & x \neq n\pi, n = 0, \pm 1, \pm 2, \pm 3, \ldots \\ 2, & \text{otherwise} \end{cases}$
and $g(x) = \begin{cases} x^2 + 1, & x \neq 0, 2 \\ 4, & x = 0 \\ 5, & x = 2 \end{cases}$
then $\lim_{x\to 0} g[f(x)]$ is ... (1986 - 2 Marks)

6) $\lim_{x\to-\infty}\left[\frac{x^4 \sin(\frac{1}{x})+x^2}{(1+|x|^3)}\right] = \ldots$ (1987 - 2 Marks)

7) If $f(9) = 9, f'(9) = 4$, then $\lim_{x\to 9} \frac{\sqrt{f(x)}-3}{\sqrt{x}-3}$ equals ... (1988 - 2 Marks)

8) ABC is an isosceles triangle inscribed in a circle of radius r. If $AB = AC$ and h is the altitude from A to BC then the triangle ABC has perimeter $P = 2(\sqrt{2hr - h^2}) + \sqrt{2hr})$ and area $A = \ldots$, also $\lim_{h\to 0} \frac{A}{P^3} = \ldots$ (1989 - 2 Marks)

9) $\lim_{x\to\infty}\left(\frac{x+6}{x+1}\right)^{x+4} = \ldots$ (1990 - 2 Marks)

10) Let $f(x) = x|x|$. The set of points where $f(x)$ is twice differentiable is ... (1992 - 2 Marks)

11) Let $f(x) = [x]\sin\left(\frac{\pi}{[x+1]}\right)$, where [] denotes the greatest integer function. The domain of f is ...and the points of discontinuity of f in the domain are ... (1996 - 2 Marks)

12) $\lim_{x\to 0}\left(\frac{1+5x^2}{1+3x^2}\right)^{\frac{1}{x^2}} = \ldots$ (1996 - 1 Mark)

13) Let $f(x)$ be a continuous function defined for $1 \leq x \leq 3$. If $f(x)$ takes rational values for all x and $f(2) = 10$, then $f(1.5) = \ldots$ (1997 - 2 Marks)

Section - B

1) If $\lim_{x\to a}[f(x)\,g(x)]$ exists then both $\lim_{x\to a} f(x)$ and $\lim_{x\to a} g(x)$ exist. (1981 - 2 Marks)

Section - C

1) If $f(x) = \sqrt{\frac{x-\sin x}{x+\cos^2 x}}$, then $\lim_{x\to\infty} f(x)$ is (1979)

a) 0
b) ∞
c) 1
d) none of these