

# 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  $k = \dots$  (1981 - 2 Marks)
- 3) A discontinuous function  $y = f(x)$  satisfying  $x^2 + y^2 = 4$  is given by  $f(x) = \dots$  (1982 - 2 Marks)
- 4)  $\lim_{x \rightarrow 1} (1-x) \tan \frac{\pi x}{2} = \dots$  (1984 - 2 Marks)
- 5) If  $f(x) = \begin{cases} \sin x, & x \neq n\pi, n = 0, \pm 1, \pm 2, \pm 3, \dots \\ 2, & \text{otherwise} \end{cases}$   
and  $g(x) = \begin{cases} x^2 + 1, & x \neq 0, 2 \\ 4, & x = 0 \\ 5, & x = 2 \end{cases}$   
then  $\lim_{x \rightarrow 0} g[f(x)]$  is..... (1986 - 2 Marks)
- 6)  $\lim_{x \rightarrow -\infty} \left[ \frac{x^4 \sin(\frac{1}{x}) + x^2}{(1+|x|^3)} \right] = \dots$  (1987 - 2 Marks)
- 7) If  $f(9) = 9, f'(9) = 4$ , then  $\lim_{x \rightarrow 9} \frac{\sqrt{f(x)} - 3}{\sqrt{x} - 3}$  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  $A = \dots$  also  $\lim_{h \rightarrow 0} \frac{A}{P^3} = \dots$  (1989 - 2 Marks)
- 9)  $\lim_{x \rightarrow \infty} \left( \frac{x+6}{x+1} \right)^{x+4} = \dots$  (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)  $\lim_{x \rightarrow 0} \left( \frac{1+5x^2}{1+3x^2} \right)^{\frac{1}{x^2}} = \dots\dots\dots$  (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  $f(1.5) = \dots\dots\dots$  (1997 - 2 Marks)

#### SECTION - B

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

#### SECTION - C

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

a) 0

c) 1

b)  $\infty$

d) none of these