LCD

1.
$$\lim_{x\to 0} \frac{x \tan 2x - 2x \tan x}{\left(1 - \cos 2x\right)^2}$$
 is

$$(B) -2$$

(C) 1/2

$$(D) -1/2$$

2.
$$f(x) = \begin{cases} ax^2 + bx + c, & |x| > 1 \\ x + 1, & |x| \le 1 \end{cases}$$
. If $f(x)$ is continuous for all values of x , then;

(A) b = 1, a + c = 0

(B)
$$b = 0$$
, $a + c = 2$

(C) b = 1, a + c = 1

The equation of the tangent to the curve $f(x) = 1 + e^{-2x}$ where it cuts the line y = 2 is 3.

(A) x + 2y = 2

(B)
$$2x + y = 2$$

(C) x - 2y = 1

(D)
$$x - 2y + 2 = 0$$

4.
$$\lim_{x \to \infty} \frac{x + \sin x}{x - \sin x} = \dots$$

$$\lim_{x \to \infty} \left(\frac{x+3}{1+x} \right)^{x+3} = \dots$$

6.
$$\lim_{x \to 0} \frac{x(1 + a\cos x) - b\sin x}{x^3} = 1, \text{ then } a = \dots b = \dots$$

7.
$$\lim_{x \to 0} \frac{1 - \cos x}{x^2}$$
 is equal to

(A) π

(C) 1/2

8
$$\lim_{x\to\infty} \frac{\sqrt{x^2-1}}{2x+1}$$
 is equal to

(A) 1

(C) -1

9. If
$$f(x) = (1 - x^n)^{1/n}$$
, $0 < x < 1$, n being an odd positive integer and $h(x) = f(f(x))$, then $h'\left(\frac{1}{2}\right)$ is

equal to

(A) 2ⁿ (C) n. 2ⁿ⁻¹

10 Among
$$\lim_{x\to 0} \sec^{-1}\left(\frac{x}{\sin x}\right)$$
 (1)

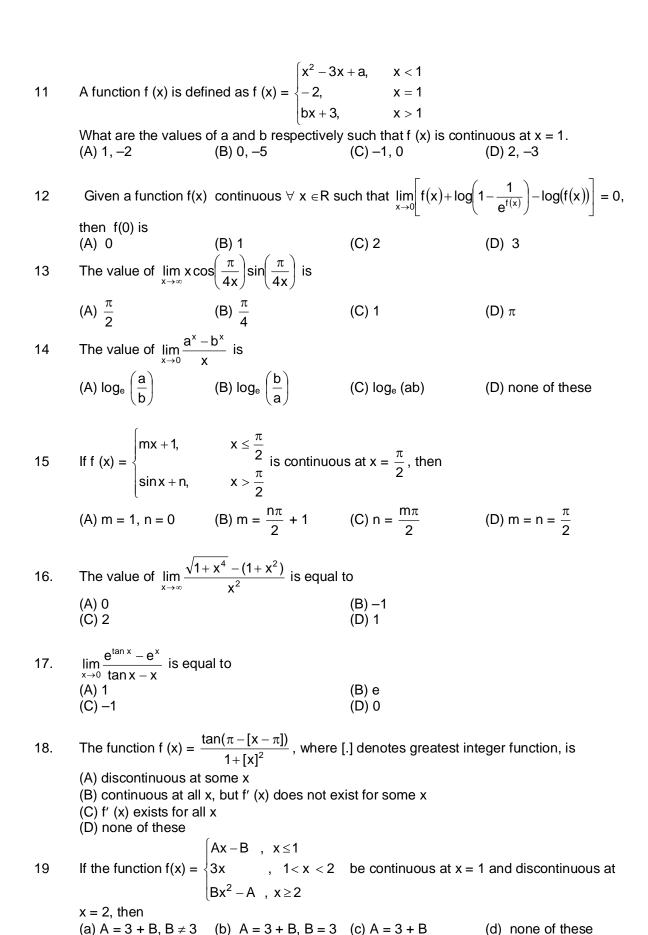
and $\lim_{x\to 0} \sec^{-1}\left(\frac{\sin x}{x}\right)$

(A) (1) exists, (2) does not exist

(B) (1) does not exist, (2) exists

(C) both (1) and (2) exist

(D) neither (1) nor (2) exists



(d) none of these

41. If
$$(x) = \begin{cases} ax^2 + b & , & x \le 1 \\ bx^2 + ax + c & , & x > 1 \end{cases}$$
, $b \ne 0$. Then $f(x)$ is continuous and differentiable at $x = 1$ if $(a) \ c = 0, \ a = 2b$ $(b) \ a = b, \ c \in R$ $(c) \ a = b, \ c = 0$ $(d) \ a = b, \ c \ne 0$.

- 42. If $f(x) = x^3 \operatorname{sgn} x$, then
 (a) f is derivable at x = 0(b) f is continuous, but not derivable at x = 0(c) LHD at x = 0 is 1
 (d) RHD at x = 0 is 0.
- 43. If $f(x) = (x x_0) \phi(x)$ and $\phi(x)$ is continuous at x = 0, then $f'(x_0)$ is equal to (a) $\phi'(x_0)$ (b) $\phi(x_0)$ (c) $x_0 \phi(x_0)$ (d) none of these.
- 44 If $f(x) = \begin{cases} \frac{\sin[x]}{[x]} & \text{for } [x] \neq 0 \\ 0 & \text{for } [x] = 0 \end{cases}$ where [x] denotes greatest integer function, then $\lim_{x \to 0} f(x) = 0$ (A) 1 (B) 0 (D) doesn't exist
- 45. If the function $f(x) = \begin{cases} \frac{\sin(2x)^2}{x^2} + e^{-x}, & x \neq 0 \\ k, & x = 0 \end{cases}$ is continuous, then k is

 (A) 2 (B) 3
 - (A) 2 (C) 4 (D) 5.
- 46. For a function y = f(x), $\frac{dy}{dx} = (x-1)(x+2)$. Find the point of local maximum and minimum for the function y = f(x).
- 47. Find the function y = f(x) for the above function if it is given that y = 2 at x = 0.
- 48. The value of derivative of f (x) = |x-1| + |x-3| at x = 2 is
 (A) -2
 (B) 0
 (C) 2
 (D) not defined
- 49. The function $f(x) = |\sin x| 1$ is
 - (A) continuous everywhere (B) not differentiable at $x = \frac{\pi}{3}$ (C) differentiable at x = 0 (D) differentiable everywhere
- (C) 2 (D) none of these
- 51. The number of points at which the function $f(x) = \frac{x}{\log |x|}$ is discontinuous is

 (A) 1 (B) 2

(C) 3 (D) 4

The number of values of x $x \in [0, 2]$ at which the real function $f(x) = |x - 1/2| + |x - 1| + \tan x$ 52. is not differentiable is (A) 2 (C) 1

(B) 3 (D) 0

LEVEL-II

1.	The function $(x^2 - 1)$ (A) -1	$ x^2 - 3x + 2 + \cos(x)$ is	s not differentiable at (C) 1	(D) 2				
2.	For $x \in R$, $\lim_{x \to \infty} \left(\frac{x-3}{x+2} \right)^x$ is							
	(A) e	(B) e^{-1}	(C) e^{-5}	(D) e ⁵				
3.	$\lim_{x \to \frac{\pi}{2}} \left[\frac{6 \cos x}{2x - \pi} \right], \text{ where [.] denotes the greatest integer function, is equal to;}$							
	(A) - 3		(C) -2	(D) none of these				
4	Let $f(x) = (\tan x)^{\frac{1}{x-\frac{\pi}{4}}}$ $\forall x \in (0, \pi/2) \sim \{\pi/4\}$, then the value of $f(\pi/4)$ such that $f(x)$ beco							
4.	_		$_{1}$, then the value of $_{1}(\pi)$	t/4} such that f(x) becomes				
	continuous at $x = \frac{\pi}{4}$		1	_				
	(A) e	(B) √e	(C) $\frac{1}{\sqrt{e}}$	(D) e ²				
5.								
	equal to; (A) 5	(B) 6	(C) 7	(D) 4				
6.	$f(x) = \sin^{-1}(\sin x), x \in [-2\pi, 2\pi].$ Total number of critical points of $f(x)$ is ; (A) 3 (B) 4 (C) 5 (D) 2							
7.	If the line $ax + by + c = 0$ is normal to the curve $x y + 5 = 0$ then (A) $a > 0$, $b > 0$ (B) $b > 0$, $a < 0$ (C) $a < 0$, $b < 0$ (D) $b < 0$, $a > 0$							
8.	The maximum value of	The maximum value of $f(x) = x \ln x \ln x \in (0,1)$ is;						
	(A) 1/e (C) 1		(B) e (D) none of these					
9.	$f(x) = 3x^3 + 4e^x - k$ is always increasing then value of $k = (A) 2$							
10.	$\lim_{x\to 2} \{[2-x] + [x-2] - x \}$ is							
	(A) 0 (C) -3		(B) 3 (D) does not exist					
11.	Let f (x) be a twice di	Let f (x) be a twice differentiable function and f'' (0) = 2 then $\lim_{x\to 2} \frac{2f(x) - 3f(2x) + f(4x)}{x^2}$ is						
	(A) 6 (C) 12		(B) 1 (D) 3					
12	Let h (x) = f (x) –{f (x)	(A) :- O						
	(A) h is \uparrow whenever f (x) is \downarrow (B) h is \uparrow whenever f(x) is \downarrow 0							

(C) h is
$$\downarrow$$
 whenever f is \downarrow

(D) nothing can be said in general

[.] G. I. F

13. Let
$$f'(x) > 0$$
, $g'(x) < 0$ for all $x \in R$, then

(A)
$$f \{g(x)\} > f \{g(x+1)\}$$

(C)
$$g(f(x)) > g(f(x+1))$$

(B)
$$f \{g(x)\} > f \{g(x-1)\}$$

(D)
$$g \{f(x)\} > g \{f(x-1)\}$$

14.
$$\lim_{X \to \infty} \frac{\ln[x]}{1+X} = \dots$$

15.
$$\lim_{n \to \infty} (3^n + 5^n + 7^n)^{\frac{1}{n}} = \dots$$

16. If
$$\alpha$$
, β are the roots of $ax^2 + bx + c = 0$ then $\lim_{x \to \alpha} \frac{1 - \cos(ax^2 + bx + c)}{(x - \alpha)^2} = \dots$

17.
$$\lim_{x\to 1} (1-x+[x-1]+[1-x]) = \dots$$

18.
$$f(x) = \sin^{-1}(\cos x)$$
 then points of nondifferentiability between $[0, 2\pi] = \dots$

19. Let
$$f(x + y) = f(x) \cdot f(y)$$
 for all $x \& y$, if $f(5) = 2$ and $f'(0) = 3$, then $f'(5) = \dots$

$$20. \qquad f(x) = \begin{cases} \frac{a \mid x^2 - x - 2 \mid}{2 + x - x^2}, & x < 2 \\ b, & x = 2 \text{ (where [.] denotes the greatest integer function). If } f(x) \\ \frac{x - [x]}{x - 2}, & x > 2 \end{cases}$$

is continuous at x = 2, then

(A)
$$a = 1$$
, $b = 2$

(B)
$$a = 1, b = 1$$

$$(C)$$
 a = 0, b = 1

$$(D)$$
 a = 2, b = 1

21. Let
$$f(x) = \begin{cases} -1, & x \le 0 \\ 0, & x = 0 \text{ and } g(x) \text{ sinx} + \cos x, \text{ then points of discontinuity of } f\{g(x)\} \text{ in } (0, 1, x > 0) \end{cases}$$

 2π) is

(A)
$$\left\{\frac{\pi}{2}, \frac{3\pi}{4}\right\}$$

(B)
$$\left\{ \frac{3\pi}{4}, \frac{7\pi}{4} \right\}$$

(C)
$$\left\{ \frac{2\pi}{3}, \frac{5\pi}{3} \right\}$$

(D)
$$\left\{ \frac{5\pi}{4}, \frac{7\pi}{3} \right\}$$

22. If
$$\alpha$$
 and β are the roots at $ax^2 + bx + c = 0$ then $\lim_{x \to \alpha} (1 + ax^2 + bx + c)^{1/(x-\alpha)}$ is

(A) a
$$(\alpha - \beta)$$

(B)
$$\ln |a(\alpha - \beta)|$$

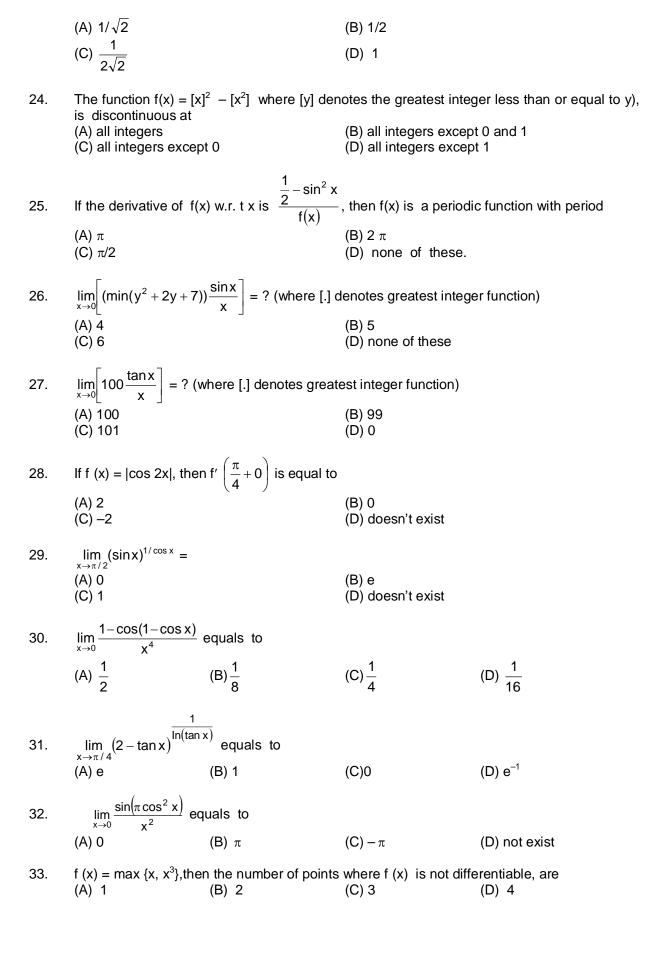
(D) $e^{a|\alpha - \beta|}$

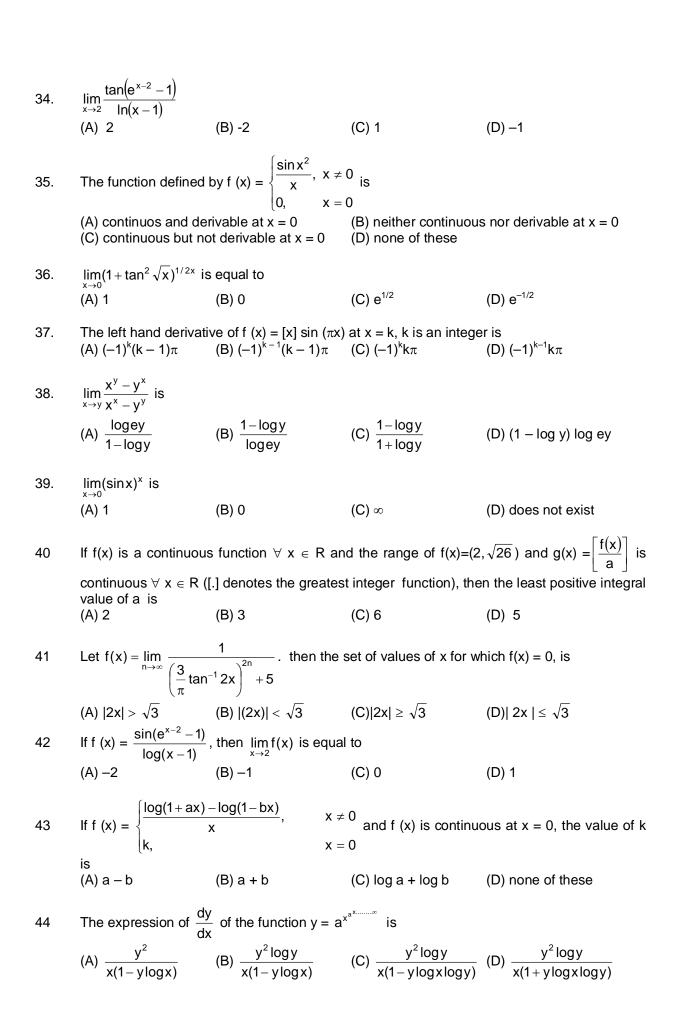
(A) a
$$(\alpha - \beta)$$

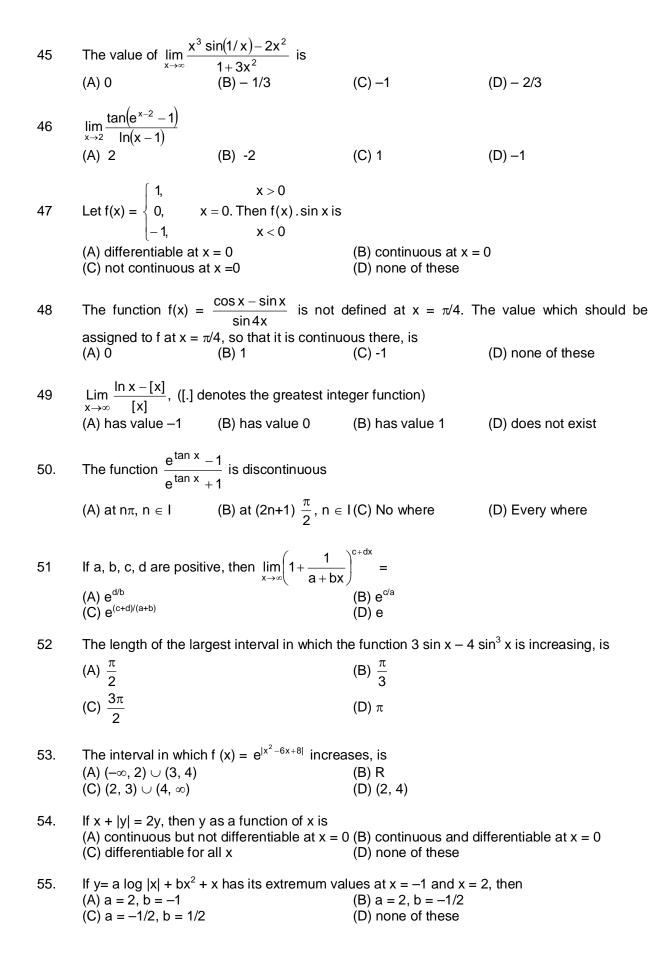
(C) $e^{a(\alpha - \beta)}$

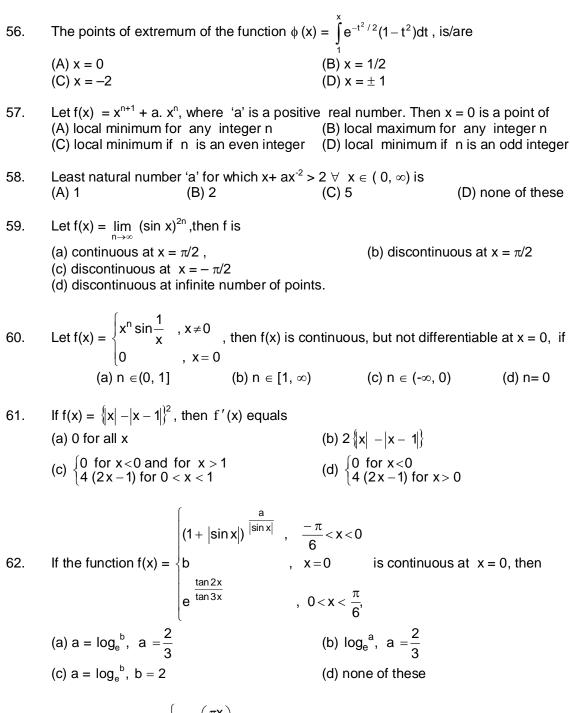
(D)
$$e^{a|\alpha - \beta|}$$

23.
$$\lim_{x \to \frac{\pi}{4}} \frac{\sqrt{2} \cos x - 1}{\cot x - 1}$$
 is equal to





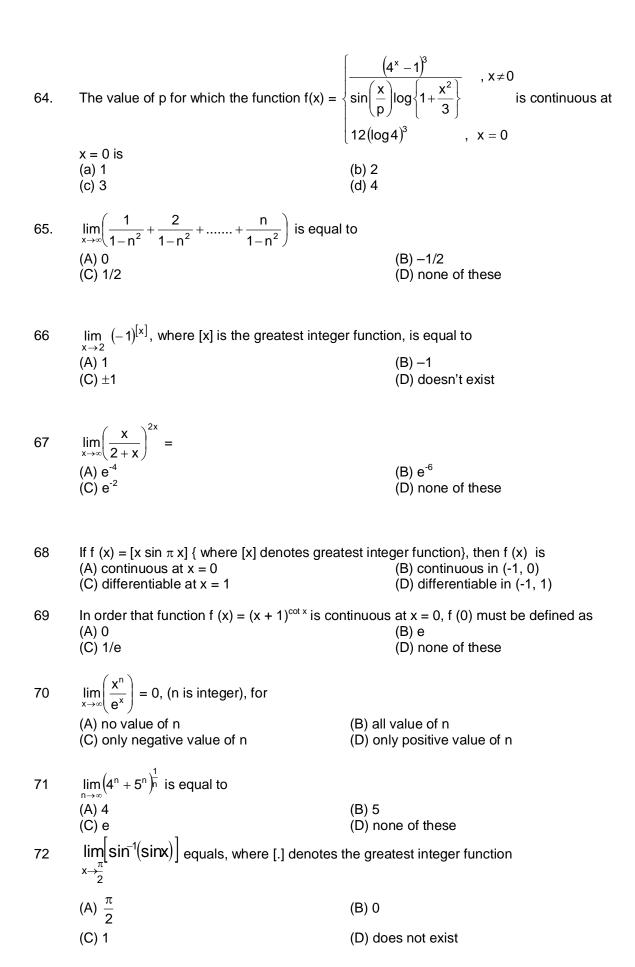


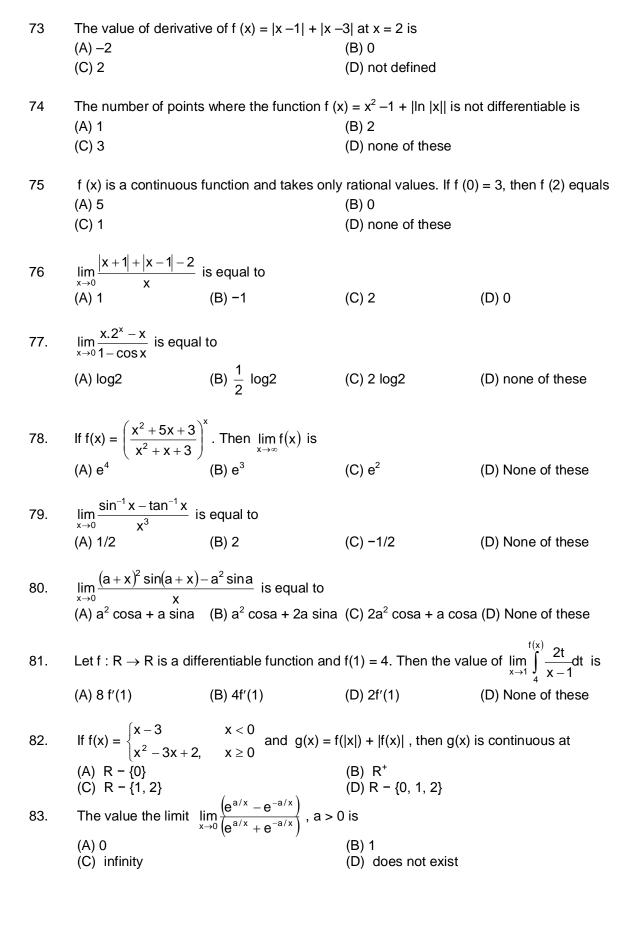


63. The function
$$f(x) = \begin{cases} sin(\frac{\pi x}{2}), & x < 1 \\ |2x - 3|[x], & x \ge 1 \end{cases}$$

(a) is continuous at x = 1

- (b) is differentiable at x = 1
- (c) is continuous but not differentiable at x = 1
- (d) none of these





84. The number of points where
$$g(f(x))$$
 is discontinuous given that $g(x) = \frac{1}{x^2 + x - 1}$ and

$$f(x) = \frac{1}{x - 3} \text{ is}$$

(A) 1

(B) 2

(D) 4

85. The value of
$$\lim_{x\to 0} \left(\frac{1+5x^2}{1+3x^2}\right)^{1/x^2}$$
 is

(A) e^{2}

(B) e^3

(C) e^5

(D) none of these

86. The number of points at which the function
$$f(x) = |x - 0.5| + |x - 1| + \tan x$$
 does not have a derivative in the interval $(0, 2)$ is

- (A) 1
- (B) 2
- (C) 3
- (D) 4

87. Let
$$f(x + y) = f(x) f(y) \forall x, y \in R$$
. Suppose that $f(3) = 3$ and $f'(0) = 11$ then $f'(3)$ is given by (A) 22 (B) 44 (C) 28 (D) 33

88. The function
$$f(x) = \begin{cases} |x-3|, & x \ge 1 \\ \frac{x^2}{4} - \frac{3x}{2} + \frac{13}{4}, & x < 1 \end{cases}$$

then which of the following is not true

(A) continuous at x = 1

(B) continuous at x = 3

(C) differentiable at x = 1

(D) differentiable at x = 3

89. The function
$$f(x) = max\{1 - x, 1 + x, 2\}, x \in (-\infty, \infty)$$
 is

- (A) differentiable at all points
- (B) differentiable at all points except at x = 1 and x = -1
- (C) continuous at all points except at x = 1 and x = -1, where it is discontinuous
- (D) None of these

90. Let
$$f(x) = [\tan^2 x]$$
 where [.] is greatest integer function then

(A) $\lim_{x\to 0} f(x)$ does not exist

- (B) f(x) is continuous at x = 0
- (C) f(x) is not differentiable x = 0
- (D) f'(0) = 1

LEVEL-III

(B) 5 (D) non

The number of critical points of f (x) = max (sin x , cos x) for $x \in (0 , 2 \pi)$

1.

(A) 2 (C) 3

2.	If f (x) = $\int_{0}^{x} (t+1) (e^{t}-1) (t-2) (t+4) dt$ then f (x) would assume the local					
	minima at;					
	(A) $x = -4$		(B) $x = 0$			
	(C) $x = -1$		(D) $x = 2$.			
3.		sin x], $0 < x < 2\pi$ wher of points of disconti		reatest integer less than or		
4.	$\lim_{x\to -1^+} \frac{\sqrt{\pi} - \sqrt{\cos^{-1} x}}{\sqrt{x+1}} \dots$					
5.	$f(x) = \frac{1}{\log x } \text{ is disc}$	continuous at x =				
6.	6. The value of the limit $\lim_{x\to 0} \left\{ 1^{1/\sin^2 x} + 2^{1/\sin^2 x} + \dots + n^{1/\sin^2 x} \right\}^{\sin^2 x}$					
	(A) ∞		(B) 0			
	(C) $\frac{n(n+1)}{2}$		(D) n			
7.	$\lim_{x\to 0}\frac{\cos(\sin x)-\cos x}{x^4}$	is equal to				
	(A) 1/5		(B) 1/6			
	(C) 1/4		(D) ½			
8.	If $tan^{-1}(x + h) = tan$	$n^{-1}(x) + (h siny)(siny)$	$- (h siny)^2 \cdot \frac{\sin 2y}{2} +$	+ $(h \sin y)^3 \cdot \frac{\sin 3y}{3} + \dots,$		
	where $x \in (0, 1), y \in (A)$ $y = tan^{-1}x$	$(\pi/4, \pi/2)$, then	(D) : -1			
	(A) y = tan 'x (C) y = cot ⁻¹ x		(B) $y = \sin^{-1}x$ (D) $y = \cos^{-1}x$			
	(c) y cot x		(2) y 300 X			
9.						
	(A) -1	(B) $\sqrt{2}$	(C) $-\frac{1}{\sqrt{2}}$	(D) $\frac{1}{\sqrt{2}}$		
	X .2					
10.	If $\lim_{x\to 0} \int_{0}^{x} \frac{t^2 dt}{(x-\sin x)\sqrt{a+t}} = 1$, then the value of a is					
	$^{\lambda \to 0}_{0} (x - \sin x) va +$ (A) 4	(B) 2	(C) 1	(D) none of these		
	V Y '	(=) =	() !	(2) 110110 01 111000		

12	For some g, let $f(x) = x(x+3) e^{g(x)}$ be a continuous function. If there exists only one point $x = c$
	such that $f'(d) = 0$, then

- (A) d < -3
 - (B) d > 0
- (C) $-3 \le d \le 0$
- (D) -3 < d < 0

$$\lim_{n\to\infty} \left[1 - \ln\left(1 + \frac{1}{n}\right)^{n-1} \right] \text{ is equal to}$$

- (A) 0
- (B) 1
- (C) e
- (D) none of these

$$14 \qquad \text{ The value of } \lim_{x\to\infty} \frac{x^n + nx^{n-1} + 1}{e^{[x]}} \,, \, n\in I \text{ is }$$

(A) 1

- (C) n
- (D) n(n-1)

Given a function
$$f(x)$$
 continuous $\forall x \in R$ such that $\lim_{x \to 0} \left[f(x) + log \left(1 - \frac{1}{e^{f(x)}} \right) - log(f(x)) \right] = 0$,

- then f(0) is
- (A) 0
- (B) 1
- (C)2
- (D) 3

Let R be the set of real numbers and f : R
$$\rightarrow$$
 R be such that for all x and y in R $|f(x) - f(y)| \le |x - y|^7$. Then f(x) is.

(A) linear

(B) constant

(C)quadratic

(D) none of these.

17. Find the value of
$$\lim_{x\to 0} \left(\frac{1}{x^2} - \cot^2 x \right)$$

(A) 2/5

(B) 2/3

(C) 1/4

(D) 1/5.

18
$$\lim_{x\to 0} \frac{\sqrt{\frac{1}{2}(1-\cos 2x)}}{x}$$
 is (A) 1

(B) -1

(C) 0

(D) doesn't exist

Given that f (x) is a non-zero differentiable function such that f (x + y) = f (x). f (y),
$$\forall$$
 x, y \in R, and f' (0) = 1 then ln f (1) is equal to

(A) 0

(B) 1

(C) e

(D) none of these

The largest interval where the function f (x) =
$$\frac{x}{1+|x|}$$
 is differentiable

(A) $(-\infty, \infty)$

(B) $(0, \infty)$

(C) $(-\infty, 0) \cup (0, \infty)$

(D) none of these

21
$$\lim_{x\to 0} \frac{(1+x)^{1/x} - e + \frac{ex}{2}}{x^2}$$
 is equal to

- (A) $\frac{11e}{24}$ (B) $-\frac{11e}{24}$ (C) $\frac{e}{24}$
- (D) None of these

- The value of the limit $\lim_{x\to 0} \left(\frac{1-3^x-4^x+12^x}{\sqrt{2\cos x+7}-3} \right)$ is 22
 - (A) 0

 $(B) - 6(\log 3) (\log 4)$

(C) 1

- (D) none of these
- Let $f\left(\frac{x+y}{2}\right) = \frac{f(x)+f(y)}{2}$, for all $x, y \in R$ and if f(x) is differentiable, and f'(0) = -1, f(0) = 123 then the function f(x) is
 - (A) -x + 1(C) $x^2 1$

(B) x + 1

- (D) x −1
- The points of discontinuity of the function fog where $g(x) = \frac{1}{x-1}$ and $f(x) = \frac{1}{x^2 + x 2}$ are 24
 - (A) $\frac{1}{2}$, 2, 1
- (B) 2, 1
- (B) 2, $\frac{1}{2}$

(D) none of these

ANSWERS

LEVEL -I

- С 1.
- 2. В
- 3. Α

С

5. 9. 13. 17. 21. 25. 29. 33. 37. 41. 45. 48.	B -2, -1 D A B A C A C A D B	6. 10. 14. 18. 22. 26. 30. 34. 38. 42. 46.	C C D D B B B A D B -2, 1	7. 11. 15. 19. 23. 27. 31. 35. 39. 43. 47.	1 D C A D B A C A B $f(x) = x^3/3 + x$ C	8. 12. 16. 20. 24. 28. 32. 36. 40. 44. ² /2 – 2x	e ² B A B A C C B A D + 2
LEVEL -II							
1. 5. 9. 13. 17. 21. 25. 29. 33. 37. 41. 45. 49. 53. 57. 61. 65. 69. 73. 77. 81. 85.	D A D B, D -1 B A C C A A B A C C C B B B C A A B	2. 6. 10. 14. 18. 22. 26. 30. 34. 38. 42. 46. 50. 54. 58. 62. 66. 70. 74. 78. 82. 86. 90.	$\begin{array}{c} C \\ B \\ C \\ O \\ O, \pi, \\ 2\pi \\ B \\ B \\ C \\ C \\ D \\ C \\ B \\ A \\ B \\ A \\ A \\ C \\ B \\ B \\ A \\ A \\ C \\ B \end{array}$	3. 7. 11. 15. 19. 23. 27. 31. 35. 39. 43. 47. 51. 55. 59. 63. 67. 71. 75. 79. 83. 87.	A A, C A 7 6 B B D A D B B A B D C A B D A D D	4. 8. 12. 16. 20. 24. 28. 32. 36. 40. 44. 48. 52. 56. 60. 64. 68. 72. 76. 80. 84. 88.	D A C $(2a\alpha + b)^2 / 2$ B B A C C C A D B D B D A C D B C D B C D
LEVEL -III							
1. 5. 9. 13. 17. 21.	C 0, ±1 D A B A	2. 6. 10. 14. 18. 22.	C D A B D B	3. 7. 15. 19. 23.	B D A B A	4. 8. 12. 16. 20. 24.	1 / √2π C D B A