EXERCISE-I

Limits

1. $\lim_{x\to 0}\frac{\log\cos x}{x}=$

(A) 0 (B) 1
(C) ∞ (D) None of these

2. $\lim_{x\to 0}\frac{\sin 2x}{x}=$

(A) 0 (B) 1
(C) 1/2 (D) 2

3. If $f(9)=9,\ f'(9)=4$,

then $\lim_{x\to 9}\frac{\sqrt{f(x)}-3}{\sqrt{x}-3}=$

(A) 2 (B) 4
(C) –2 (D) –4

4. $\lim_{x\to 0}\frac{|x|}{x}=$

(A) 1 (B) –1
(C) 0 (D) Does not exist

5. $\lim_{h\to 0}\frac{\sqrt{x+h}-\sqrt{x}}{h}=$

(A) $\frac{1}{2\sqrt{x}}$ (B) $\frac{1}{\sqrt{x}}$
(C) $2\sqrt{x}$ (D) $\sqrt{x}$

6. $\lim_{x\to 0}\frac{2^x-1}{(1+x)^{1/2}-1}=$

(A) $\log 2$ (B) $\log 4$
(C) $\log\sqrt{2}$ (D) None of these

7. $\lim_{x\to 0}\frac{1-\cos mx}{1-\cos nx}=$

(A) m/n (B) n/m
(C) $\frac{m^2}{n^2}$ (D) $\frac{n^2}{m^2}$

8. $\lim_{x\to 0}\frac{e^{\sin x}-1}{x}=$

(A) 1 (B) e
(C) $1/e$ (D) None of these

9. $\lim_{x\to\infty}\sqrt{x}(\sqrt{x+5}-\sqrt{x})=$

(A) 5 (B) 3
(C) 5/2 (D) 3/2

10. $\lim_{x\to 1}\frac{x-1}{2x^2-7x+5}=$

(A) 1/3 (B) 1/11
(C) –1/3 (D) None of these

11. $\lim_{x\to\pi/6}\frac{\cot^2\theta-3}{\operatorname{cosec}\theta-2}=$

(A) 2 (B) 4
(C) 6 (D) 0

12. $\lim_{x\to 0}\frac{(1+x)^5-1}{(1+x)^3-1}=$

(A) 0 (B) 1
(C) 5/3 (D) 3/5

13. If $\lim_{x\to a}\frac{x^9+a^9}{x+a}=9$, then $a=$

(A) $9^{1/8}$ (B) ± 2
(C) ± 3 (D) None of these

14. $\lim_{x\to 0+}\frac{xe^{1/x}}{1+e^{1/x}}=$

(A) 0 (B) 1
(C) ∞ (D) None of these

15. $\lim_{x\to 1}[x]=$

(A) 0 (B) 1
(C) Does not exist (D) None of these

16. $\lim_{x\to 0}\frac{\sin 2x+\sin 6x}{\sin 5x-\sin 3x}=$

(A) 1/2 (B) 1/4
(C) 2 (D) 4

17. The value of $\lim_{\theta\to 0}\left(\frac{\sin\frac{\theta}{4}}{\theta}\right)$ is

(A) 0 (B) 1/4
(C) 1 (D) Not in existence

18. The value of $\lim_{x\to\infty}\left(\frac{x^2+bx+4}{x^2+ax+5}\right)$ is

(A) b/a (B) 1
(C) 0 (D) 4/5

19. If $f(r)=\pi r^2$, then $\lim_{h\to 0}\frac{f(r+h)-f(r)}{h}=$

(A) πr^2 (B) $2\pi r$
(C) 2π (D) $2\pi r^2$

20. $\lim_{x\to 0} x\log(\sin x)=$

(A) –1 (B) $\log_e 1$
(C) 1 (D) None of these

21. $\lim_{x\to 0}\frac{y^2}{x}=$ ...., where $y^2=ax+bx^2+cx^3$

(A) 0 (B) 1
(C) a (D) None of these

22. $\lim_{x\to 0}\frac{(1+x)^{1/2}-(1-x)^{1/2}}{x}=$

(A) 0 (B) 1/2
(C) 1 (D) –1

23. $\lim_{x\to 1}\frac{x^3-1}{x^2+5x-6}=$

(A) 0 (B) $\frac{3}{7}$
(C) $\frac{1}{2}$ (D) $-\frac{1}{6}$

24. $\lim_{x\to a}\frac{\sqrt{a+2x}-\sqrt{3x}}{\sqrt{3a+x}-2\sqrt{x}}=$

(A) $\frac{1}{\sqrt{3}}$ (B) $\frac{2}{3\sqrt{3}}$
(C) $\frac{2}{\sqrt{3}}$ (D) $\frac{2}{3}$

25. $\lim_{x\to 1}\frac{1-x^{-1/3}}{1-x^{-2/3}}=$

(A) $\frac{1}{3}$ (B) $\frac{1}{2}$
(C) $\frac{2}{3}$ (D) $-\frac{2}{3}$

26. $\lim_{x\to 0}\frac{(1+x)^n-1}{x}=$

(A) n (B) 1
(C) –1 (D) None of these

27. $\lim_{x\to 0}\left(\frac{\tan 3x}{x}+\cos x\right)=$

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

28. $\lim_{x\to 0}\frac{\sqrt{1+x}-\sqrt{1-x}}{\sin^{-1}x}=$

(A) 2 (B) 1
(C) –1 (D) None of these

29. $\lim_{y\to 0}\frac{(x+y)\sec(x+y)-x\sec x}{y}=$

(A) $\sec x(x\tan x+1)$ (B) $x\tan x+\sec x$
(C) $x\sec x+\tan x$ (D) None of these

30. $\lim_{x\to 0}\frac{x.2^x-x}{1-\cos x}=$

(A) 0 (B) $\log 4$
(C) $\log 2$ (D) None of these

31. $\lim_{x\to\infty}\frac{(2x+1)^{40}(4x-1)^5}{(2x+3)^{45}}=$

(A) 16 (B) 24
(C) 32 (D) 8

32. $\lim_{x\to 0}\left[\frac{x}{\tan^{-1}2x}\right]=$

(A) 0 (B) $\frac{1}{2}$
(C) 1 (D) ∞

33. $\lim_{x\to 0}\frac{1-\cos x}{\sin^2 x}=$

(A) $\frac{1}{2}$ (B) $-\frac{1}{2}$
(C) 2 (D) None of these

34. $\lim_{x\to 0}\frac{\sin 3x+\sin x}{x}=$

(A) $\frac{1}{3}$ (B) 3

(C) 4 (D) $\frac{1}{4}$

35. $\lim_{x\to\pi/2}\frac{1+\cos 2x}{(\pi-2x)^2}=$

(A) 1 (B) 2

(C) 3 (D) $\frac{1}{2}$

36. $\lim_{x\to 0}\frac{1-\cos 6x}{x}=$

(A) 0 (B) 6

(C) $\frac{1}{3}$ (D) None of these

37. $\lim_{x\to 0}\frac{\sin mx}{\tan nx}=$

(A) $\frac{n}{m}$ (B) $\frac{m}{n}$

(C) mn (D) None of these

38. $\lim_{x\to 0}\frac{3\sin x-\sin 3x}{x^3}=$

(A) 4 (B) –4

(C) $\frac{1}{4}$ (D) None of these

39. $\lim_{x\to 0}\frac{x^3}{\sin x^2}=$

(A) 0 (B) $\frac{1}{3}$

(C) 3 (D) $\frac{1}{2}$

40. If $f(x)=\begin{cases} x, & \text{when } x>1 \\ x^2, & \text{when } x<1 \end{cases}$,

then $\lim_{x\to 1}f(x)=$

(A) x^2 (B) x

(C) –1 (D) 1

Continuity

41. The points at which the function $f(x)=\frac{x+1}{x^2+x-12}$ is discontinuous, are

(A) –3, 4 (B) 3, –4

(C) –1,–3, 4 (D) –1, 3, 4

42. If $f(x)=\begin{cases} e^x+ax, & x<0 \\ b(x-1)^2, & x\ge 0 \end{cases}$ then

(A) $\lim_{x\to 0+}f(x)\ne 2$

(B) $\lim_{x\to 0-}f(x)=0$

(C) $f(x)$ is continuous at $x=0$

(D) None of these

43. If $f(x)=\begin{cases} x^2\sin\frac{1}{x}, & \text{when } x\ne 0 \\ 0, & \text{when } x=0 \end{cases}$, then

(A) $f(0+0)=1$

(B) $f(0-0)=1$

(C) f is continuous at $x=0$

(D) None of these

44. The value of *k* so that the function $f(x)=\begin{cases} k(2x-x^2), & \text{when } x<0 \\ \cos x, & \text{when } x\ge 0 \end{cases}$ is continuous at $x=0$, is

(A) 1 (B) 2

(C) 4 (D) None of these

45. If $f(x)=\begin{cases} \frac{x}{e^{1/x}+1}, & \text{when } x\ne 0 \\ 0, & \text{when } x=0 \end{cases}$, then

(A) $\lim_{x\to 0+}f(x)=1$

(B) $\lim_{x\to 0-}f(x)=1$

(C) $f(x)$ is continuous at $x=0$

(D) None of these

46. If $f(x)=\begin{cases}(1+2x)^{1/x}, \text{for } x\neq 0\\ e^2, \text{for } x=0\end{cases}$, then

(A) $\lim_{x\to 0+} f(x)=e$

(B) $\lim_{x\to 0-} f(x)=e^2$

(C) $f(x)$ is discontinuous at $x=0$

(D) None of these

47. If $f(x)=\begin{cases}2^{1/x}, \text{for } x\neq 0\\ 3, \text{for } x=0\end{cases}$, then

(A) $\lim_{x\to 0+} f(x)=0$

(B) $\lim_{x\to 0-} f(x)=\infty$

(C) $f(x)$ is continuous at $x=0$

(D) None of these

48. If $f(x)=\begin{cases}\frac{1}{x}\sin x^2, x\neq 0\\ 0, x=0\end{cases}$, then

(A) $\lim_{x\to 0+} f(x)\neq 0$

(B) $\lim_{x\to 0-} f(x)\neq 0$

(C) $f(x)$ is continuous at $x=0$

(D) None of these

49. If $f(x)=\begin{cases}x-1, & x<0\\ \frac{1}{4}, & x=0\\ x^2, & x>0\end{cases}$, then

(A) $\lim_{x\to 0+} f(x)=1$

(B) $\lim_{x\to 0-} f(x)=1$

(C) $f(x)$ is discontinuous at $x=0$

(D) None of these

50. Which of the following statements is true for graph $f(x)=\log x$

(A) Graph shows that function is continuous

(B) Graph shows that function is discontinuous

(C) Graph finds for negative and positive values of *x*

(D) Graph is symmetric along *x*-axis

51. If $f(x)=\begin{cases}\frac{|x-a|}{x-a}, \text{when } x\neq a\\ 1, \text{when } x=a\end{cases}$,then

(A) $f(x)$ is continuous at $x=a$

(B) $f(x)$ is discontinuous at $x=a$

(C) $\lim_{x\to a} f(x)=1$

(D) None of these

52. If $f(x)=\begin{cases}x^2, \text{ when } x\neq 1\\ 2, \text{when } x=1\end{cases}$ then

(A) $\lim_{x\to 1} f(x)=2$

(B) $f(x)$ is continuous at $x=1$

(C) $f(x)$ is discontinuous at $x=1$

(D) None of these

53. If $f(x)=\begin{cases}1+x, \text{when } x\leq 2\\ 5-x, \text{when } x\leq 3\end{cases}$, then

(A) $f(x)$ is continuous at $x=2$

(B) $f(x)$ is discontinuous at $x=2$

(C) $f(x)$ is continuous at $x=3$

(D) None of these

54. If $f(x)=\begin{cases}1, \text{when } 0<x\leq\frac{3\pi}{4}\\ 2\sin\frac{2}{9}x, \text{when } \frac{3\pi}{4}<x<\pi\end{cases}$, then

(A) $f(x)$ is continuous at $x=0$

(B) $f(x)$ is continuous at $x=\pi$

(C) $f(x)$ is continuous at $x=\frac{3\pi}{4}$

(D) $f(x)$ is discontinuous at $x=\frac{3\pi}{4}$

55. If $f(x)=\begin{cases}x\sin x, \text{when } 0<x\leq\frac{\pi}{2}\\ \frac{\pi}{2}\sin(\pi+x), \text{when } \frac{\pi}{2}<x<\pi\end{cases}$, then

(A) $f(x)$ is discontinuous at $x=\pi/2$

(B) $f(x)$ is continuous at $x=\pi/2$

(C) $f(x)$ is continuous at $x=0$

(D) None of these

56. If $f(x)=\begin{cases}\dfrac{1-\cos 4x}{x^2}, & \text{when } x<0\\ a, & \text{when } x=0\\ \dfrac{\sqrt{x}}{\sqrt{(16+\sqrt{x})}-4}, & \text{when } x>0\end{cases}$, is continuous at $x=0$, then the value of 'a' will be

(A) 8 (B) –8
(C) 4 (D) None of these

57. If $f(x)=\begin{cases}ax^2-b, & \text{when } 0\le x<1\\ 2, & \text{when } x=1\\ x+1, & \text{when } 1<x\le 2\end{cases}$ is continuous at $x=1$, then the most suitable value of a, b are

(A) $a=2, b=0$ (B) $a=1, b=-1$
(C) $a=4, b=2$ (D) All the above

58. If $f(x)=\begin{cases}\dfrac{x-|x|}{x}, & \text{when } x\ne 0\\ 2, & \text{when } x=0\end{cases}$, then

(A) $f(x)$ is continuous at $x=0$
(B) $f(x)$ is discontinuous at $x=0$
(C) $\lim\limits_{x\to 0} f(x)=2$
(D) None of these

59. If $f(x)=\begin{cases}\dfrac{x^4-16}{x-2}, & \text{when } x\ne 2\\ 16, & \text{when } x=2\end{cases}$, then

(A) $f(x)$ is continuous at $x=2$
(B) $f(x)$ is discountinous at $x=2$
(C) $\lim\limits_{x\to 2} f(x)=16$
(D) None of these

60. If $f(x)=\begin{cases}x^2, & \text{when } x\le 1\\ x+5, & \text{when } x>1\end{cases}$, then

(A) $f(x)$ is continuous at $x=1$
(B) $f(x)$ is discontinuous at $x=1$
(C) $\lim\limits_{x\to 1} f(x)=1$
(D) None of these

61. If $f(x)=\begin{cases}x\sin\dfrac{1}{x}, & x\ne 0\\ k, & x=0\end{cases}$ is continuous at $x=0$, then the value of k is

(A) 1 (B) –1
(C) 0 (D) 2

62. If $f(x)=\begin{cases}\dfrac{\sin[x]}{[x]+1}, & \text{for } x>0\\ \dfrac{\cos\frac{\pi}{2}[x]}{[x]}, & \text{for } x<0\\ k, & \text{at } x=0\end{cases}$; where $[x]$ denotes the greatest integer less than or equal to x, then in order that f be continuous at $x=0$, the value of k is

(A) Equal to 0 (B) Equal to 1
(C) Equal to –1 (D) Indeterminate

63. The function $f(x)=\begin{cases}x+2, & 1\le x\le 2\\ 4, & x=2\\ 3x-2, & x>2\end{cases}$ is continuous at

(A) $x=2$ only (B) $x\le 2$
(C) $x\ge 2$ (D) None of these

64. If the function

$$f(x)=\begin{cases}5x-4, & \text{if } 0<x\le 1\\ 4x^2+3bx, & \text{if } 1<x<2\end{cases}$$

is continuous at every point of its domain, then the value of b is

(A) – 1 (B) 0
(C) 1 (D) None of these

65. The values of A and B such that the function

$$f(x)=\begin{cases}-2\sin x, & x\le -\dfrac{\pi}{2}\\ A\sin x+B, & -\dfrac{\pi}{2}<x<\dfrac{\pi}{2},\\ \cos x, & x\ge \dfrac{\pi}{2}\end{cases}$$

is continuous everywhere are

(A) $A=0, B=1$ (B) $A=1, B=1$
(C) $A=-1, B=1$ (D) $A=-1, B=0$

66. If $f(x)=\dfrac{x^2-10x+25}{x^2-7x+10}$ for $x\neq 5$ and f is continuous at $x=5$, then $f(5)=$

(A) 0 (B) 5
(C) 10 (D) 25

67. In order that the function $f(x)=(x+1)^{\cot x}$ is continuous at $x=0$, $f(0)$ must be defined as

(A) $f(0)=\dfrac{1}{e}$ (B) $f(0)=0$
(C) $f(0)=e$ (D) None of these

68. The function $f(x)=\sin|x|$ is

(A) Continuous for all *x*
(B) Continuous only at certain points
(C) Differentiable at all points
(D) None of these

69. If $f(x)=|x|$, then $f(x)$ is

(A) Continuous for all *x*
(B) Differentiable at $x=0$
(C) Neither continuous nor differentiable at $x=0$
(D) None of these

70. If $f(x)=\begin{cases}\dfrac{1-\sin x}{\pi-2x}, & x\neq\dfrac{\pi}{2}\\ \lambda, & x=\dfrac{\pi}{2}\end{cases}$, be continuous at $x=\pi/2$, then value of λ is

(A) –1 (B) 1
(C) 0 (D) 2

71. The function defined by

$$f(x)=\begin{cases}\left(x^2+e^{\frac{1}{2-x}}\right)^{-1}, & x\neq 2\\ k, & x=2\end{cases},$$

is continuous from right at the point *x* = 2, then *k* is equal to

(A) 0 (B) 1/4
(C) –1/4 (D) None of these

72. For the function

$$f(x)=\frac{\log_e(1+x)-\log_e(1-x)}{x}$$

to be continuous at $x=0$, the value of $f(0)$, should be

(A) –1 (B) 0
(C) –2 (D) 2

73. If

$$f(x)=\begin{cases}\dfrac{\sqrt{1+kx}-\sqrt{1-kx}}{x} & ,\text{for } -1\le x<0\\ 2x^2+3x-2 & ,\text{for } 0\le x\le 1\end{cases},$$

is continuous at $x=0$, then $k=$

(A) – 4 (B) – 3
(C) – 2 (D) – 1

74. The function $f(x)=\dfrac{1-\sin x+\cos x}{1+\sin x+\cos x}$ is not defined at $x=\pi$. The value of $f(\pi)$, so that $f(x)$ is continuous at $x=\pi$, is

(A) $-\dfrac{1}{2}$ (B) $\dfrac{1}{2}$
(C) – 1 (D) 1

75. If $f(x)=\begin{cases}\dfrac{1-\cos x}{x}, & x\neq 0\\ k, & x=0\end{cases}$ is continuous at $x=0$ then $k=$

(A) 0 (B) $\dfrac{1}{2}$
(C) $\dfrac{1}{4}$ (D) $-\dfrac{1}{2}$

76. A function *f* on *R* into itself is continuous at a point *a* in *R*, iff for each $\in>0$, there exists, $\delta>0$ such that

(A) $|f(x)-f(a)|<\in\Rightarrow|x-a|<\delta$
(B) $|f(x)-f(a)|>\in\Rightarrow|x-a|>\delta$
(C) $|x-a|>\delta\Rightarrow|f(x)-f(a)|>\in$
(D) $|x-a|<\delta\Rightarrow|f(x)-f(a)|<\in$

77. For the function $f(x)=\begin{cases}\dfrac{e^{1/x}-1}{e^{1/x}+1}, & x\neq 0\\ 0 & , x=0\end{cases}$, which of the following is correct

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

(B) $f(x)$ is continuous at $x = 0$

(C) $\lim_{x\to 0} f(x)=1$

(D) $\lim_{x\to 0} f(x)$ exists but $f(x)$ is not continuous at $x = 0$

78. The function '*f*' is defined by $f(x)=2x-1,$ if $x>2$, $f(x)=k$ if $x=2$ and $x^2-1,$ if $x<2$ is continuous, then the value of *k* is equal to

(A) 2 (B) 3
(C) 4 (D) –3

79. In the function $f(x)=\dfrac{2x-\sin^{-1}x}{2x+\tan^{-1}x}, (x\neq 0)$ is continuous at each point of its domain, then the value of $f(0)$ is

(A) 2 (B) $1/3$
(C) $2/3$ (D) $-1/3$

80. The function $f(x)=|x|+\dfrac{|x|}{x}$ is

(A) Continuous at the origin

(B) Discontinuous at the origin because $|x|$ is discontinuous there

(C) Discontinuous at the origin because $\dfrac{|x|}{x}$ is discontinuous there

(D) Discontinuous at the origin because both $|x|$ and $\dfrac{|x|}{x}$ are discontinuous there

Differentiability

81. There exists a function $f(x)$ satisfying $f(0)=1,\ f'(0)=-1, f(x)>0$ for all *x* and

(A) $f(x)<0, \forall x$

(B) $-1<f''(x)<0, \forall x$

(C) $-2<f''(x)\leq -1, \forall x$

(D) $f''(x)<-2, \forall x$

82. The function $f(x)=\begin{cases}x, & \text{if } 0\leq x\leq 1\\ 1, & \text{if } 1<x\leq 2\end{cases}$ is

(A) Continuous at all *x*, $0\leq x\leq 2$ and differentiable at all *x*, except $x = 1$ in the interval [0,2]

(B) Continuous and differentiable at all *x* in [0,2]

(C) Not continuous at any point in [0,2]

(D) Not differentiable at any point [0,2]

83. The function $f(x)=|x|$ at $x = 0$ is

(A) Continuous but non-differentiable

(B) Discontinuous and differentiable

(C) Discontinuous and non-differentiable

(D) Continuous and differentiable

84. Consider $f(x)=\begin{cases}\dfrac{x^2}{|x|}, & x\neq 0\\ 0, & x=0\end{cases}$

(A) $f(x)$ is discontinuous everywhere

(B) $f(x)$ is continuous everywhere

(C) $f'(x)$ exists in $(-1,1)$

(D) $f'(x)$ exists in $(-2,2)$

85. At the point $x=1$, the given function $f(x)=\begin{cases}x^3-1; & 1<x<\infty\\ x-1; & -\infty<x\leq 1\end{cases}$ is

(A) Continuous and differentiable

(B) Continuous and not differentiable

(C) Discontinuous and differentiable

(D) Discontinuous and not differentiable

86. Let [x] denotes the greatest integer less than or equal to x. If $f(x)=[x \sin \pi x]$, then $f(x)$ is

(A) Continuous at $x=0$

(B) Continuous in $(-1,0)$

(C) Differentiable in $(-1,1)$

(D) All the above

87. The function defined by

$$f(x)=\begin{cases}|x-3|; & x \geq 1 \\ \frac{1}{4}x^2-\frac{3}{2}x+\frac{13}{4}; & x<1\end{cases} \text{ is}$$

(A) Continuous at $x=1$

(B) Continuous at $x=3$

(C) Differentiable at $x=1$

(D) All the above

88. If $f(x)=\begin{cases}e^x+ax, & x<0 \\ b(x-1)^2, & x \geq 0\end{cases}$ is differentiable at $x=0$, then (a,b) is

(A) $(-3,-1)$ (B) $(-3,1)$

(C) $(3,1)$ (D) $(3,-1)$

89. The function $y=|\sin x|$ is continuous for any x but it is not differentiable at

(A) $x=0$ only

(B) $x=\pi$ only

(C) $x=k\pi$ (k is an integer) only

(D) $x=0$ and $x=k\pi$ (k is an integer)

90. The function $y=e^{-|x|}$ is

(A) Continuous and differentiable at $x=0$

(B) Neither continuous nor differentiable at $x=0$

(C) Continuous but not differentiable at $x=0$

(D) Not continuous but differentiable at $x=0$

91. Which of the following is not true

(A) A polynomial function is always continuous

(B) A continuous function is always differentiable

(C) A differentiable function is always continuous

(D) e^x is continuous for all x

92. The function

$$f(x)=x^2 \sin\frac{1}{x}, x \neq 0, f(0)=0 \text{ at } x=0$$

(A) Is continuous but not differentiable

(B) Is discontinuous

(C) Is having continuous derivative

(D) Is continuous and differentiable

93. If $f(x)=\begin{cases}\dfrac{x-1}{2x^2-7x+5} & \text{for } x \neq 1 \\ -\dfrac{1}{3} & \text{for } x=1\end{cases}$, then $f'(1)=$

(A) –1/9 (B) –2/9

(C) –1/3 (D) 1/3

94. If $f(x)=\dfrac{x}{1+|x|}$ for $x \in R$, then $f'(0)=$

(A) 0 (B) 1

(C) 2 (D) 3

95. The value of m for which the function $f(x)=\begin{cases}mx^2, x \leq 1 \\ 2x, x>1\end{cases}$ is differentiable at $x=1$, is

(A) 0 (B) 1

(C) 2 (D) Does not exist

96. Let $f(x)=\begin{cases}\sin x, & \text{for } x \geq 0 \\ 1-\cos x, & \text{for } x \leq 0\end{cases}$ and $g(x)=e^x$. Then $(gof)'(0)$ is

(A) 1 (B) –1

(C) 0 (D) None of these

97. Suppose $f(x)$ is differentiable at $x=1$ and $\lim_{h\to 0}\frac{1}{h}f(1+h)=5$, then $f'(1)$ equals

(A) 5 (B) 6
(C) 3 (D) 4

98. If *f* is a real- valued differentiable function satisfying $|f(x)-f(y)|\le(x-y)^2, x, y\in R$ and $f(0)=0$, then $f(1)$ equal

(A) 2 (B) 1
(C) –1 (D) 0

99. Let f be differentiable for all x. If $f(1)=-2$ and $f'(x)\ge 2$ for $x\in[1,6]$, then

(A) $f(6)<5$ (B) $f(6)=5$
(C) $f(6)\ge 8$ (D) $f(6)<8$

100. $f(x)=\left||x|-1\right|$ is not differentiable at

(A) 0 (B) $\pm 1, 0$
(C) 1 (D) ± 1

101. If $f(x)=x^2-2x+4$ and $\frac{f(5)-f(1)}{5-1}=f'(c)$ then value of c will be

(A) 0 (B) 1
(C) 2 (D) 3

102. Let $f(x+y)=f(x)+f(y)$ and $f(x)=x^2g(x)$ for all $x, y\in R$, where $g(x)$ is continuous function. Then $f'(x)$ is equal to

(A) $g'(x)$ (B) $g(0)$
(C) $g(0)+g'(x)$ (D) 0

103. The function $f(x)=(x^2-1)|x^2-3x+2|+\cos(|x|)$ is not differentiable at

(A) –1 (B) 0
(C) 1 (D) 2

104. The function which is continuous for all real values of *x* and differentiable at $x=0$ is

(A) $|x|$ (B) $\log x$
(C) $\sin x$ (D) $x^{\frac{1}{2}}$

105. Which of the following is not true

(A) Every differentiable function is continuous
(B) If derivative of a function is zero at all points, then the function is constant
(C) If a function has maximum or minima at a point, then the function is differentiable at that point and its derivative is zero
(D) If a function is constant, then its derivative is zero at all points

106. If $f(x)=\begin{cases} x+2, -1<x<3 \\ 5 \quad , \ x=3 \\ 8-x, \ \ x>3 \end{cases}$, then at $x=3$, $f'(x)=$

(A) 1 (B) – 1
(C) 0 (D) Does not exist

107. If $f(x)=\begin{cases} x, & 0\le x\le 1 \\ 2x-1, & 1<x \end{cases}$, then

(A) *f* is discontinuous at $x=1$
(B) *f* is differentiable at $x=1$
(C) *f* is continuous but not differentiable at $x=1$
(D) None of these

108. If $f(x)=\begin{cases} 1, \ x<0 \\ 1+\sin x, \ 0\le x<\frac{\pi}{2} \end{cases}$ then $f'(0)=$

(A) 1 (B) 0
(C) ∞ (D) Does not exist

109. If $f(x)=\begin{cases} ax^2+b; \ x\le 0 \\ x^2; x>0 \end{cases}$ possesses derivative at $x=0$, then

(A) $a=0, b=0$ (B) $a>0,=0$
(C) $a\in R,=0$ (D) None of these

110. The set of all those points, where the function $f(x)=\frac{x}{1+|x|}$ is differentiable, is

(A) $(-\infty,\infty)$ (B) $[0,\infty]$
(C) $(-\infty,0)\cup(0,\infty)$ (D) $(0,\infty)$