

Continuity, Differentiability and Differentiation

Exerise-1: Single Choice Problems

- Let f' be a differentiable real valued function satisfying $f(x + 2y) = f(x) + f(2y) + 6xy(x + 2y) \forall x, y \in \mathbb{R}$. Then $f(0), f(2) \dots$ are in :
(a) AP (b) GP
(c) HP (d) None of these
- The number of point of non-differentiability for $f(x) = \max\{|x| - 1, \frac{1}{2}\}$ is :
(a) 4 (b) 3
(c) 2 (d) 5
- Number of points of discontinuity of $f(x) = \left\{\frac{x}{5}\right\} + \left\{\frac{x}{2}\right\}$ in $x \in [0, 100]$ is /are (where $[.]$ denotes greatest integer function and $\{.\}$ denotes fractional part function)
(a) 50 (b) 51
(c) 52 (d) 61
- If $f(x)$ has isolated point of discontinuity at $x = a$ such that $|f(x)|$ is continuous at $x = a$ then :
(a) $\lim_{x \rightarrow a} f(x)$ does not exist (b) $\lim_{x \rightarrow a} f(x) + f(a) = 0$
(c) $f(a) = 0$ (d) None of these
- If $f(x)$ is a thrice differentiable function such that, $\frac{f(4x) - 3f(3x) + 3f(2x) - f(x)}{x^3} = 12$ then the value of $f''(0)$ equals to :
(a) 0 (b) 1
(c) 12 (d) None of these

6. $y \frac{1}{1+(\tan\theta)\sin\theta-\cos\theta} + \frac{1}{1+(\tan\theta)\cos\theta-\sin\theta} + \frac{1}{1+(\cot\theta)\cos\theta-\cot\theta} + \frac{1}{1+(\cot\theta)\sin\theta-\cot\theta}$ then $\frac{dy}{dx}$ at $\theta = \pi/3$ is :

- (a) 0 (b) 1
(c) $\sqrt{3}$ (d) None of these

7. Let $f'(x) = \sin(x^2)$ and $y = f(x^2 + 1)$ then $\frac{dy}{dx}$ at $x = 1$ is :

- (a) $2 \sin 2$ (b) $2 \cos 2$
(c) $2 \sin 4$ (d) $\cos 2$

8. If $f(x) = |\sin x - |\cos x||$, then $f'(\frac{7\pi}{6}) =$

- (a) $\frac{\sqrt{3}+1}{2}$ (b) $\frac{1-\sqrt{3}}{2}$
(c) $\frac{\sqrt{3}-1}{2}$ (d) $\frac{-1-\sqrt{3}}{2}$

9. If $2 \sin x \cdot \cos y = 1$, then $\frac{d^2y}{dx^2}$ at $(\frac{\pi}{4}, \frac{\pi}{4})$ is

- (a) -4 (b) -2
(c) -6 (d) 0

10. f is a differentiable function such that $x = f(t^2)$, $y = f(t^3)$ and

$f'(1) \neq 0$ if $\left(\frac{d^2y}{dx^2}\right)_{t=1} =$

- (a) $\frac{3}{4} \left(\frac{f''(1)+f'(1)}{(f'(1))^2} \right)$ (b) $\frac{3}{4} \left(\frac{f'(1)+f''(1)-f'(1)}{(f'(1))^2} \right)$
(c) $\frac{4}{3} \frac{f''(1)}{(f'(1))^2}$ (d) $\frac{4}{3} \left(\frac{f'(1)+f''(1)-f'(1)}{(f'(1))^2} \right)$

11. Let $f(x) = \begin{cases} ax + 1 & \text{if } x < 1 \\ 3 & \text{if } x = 1 \\ bx^2 + 1 & \text{if } x > 1 \end{cases}$. If $f(x)$ is continuous at $x = 1$ then $(a - b)$ is

equal to :

- (a) 0 (b) 1
(c) 2 (d) 4

12. If $y = 1 + \frac{\alpha}{\left(\frac{1}{x}-\alpha\right)} + \frac{\beta/x}{\left(\frac{1}{x}-\alpha\right)\left(\frac{1}{x}-\beta\right)} + \frac{\lambda/x^2}{\left(\frac{1}{x}-\alpha\right)\left(\frac{1}{x}-\beta\right)\left(\frac{1}{x}-\lambda\right)}$, then $\frac{dy}{dx}$ is :

- (a) $y\left(\frac{\alpha}{\alpha-x} + \frac{\beta}{\beta-x} + \frac{\gamma}{\gamma-x}\right)$ (b) $\frac{y}{x}\left(\frac{\alpha}{1/x-\alpha} + \frac{\beta}{1/x-\beta} + \frac{\gamma}{1/x-\gamma}\right)$
(c) $y\left(\frac{\alpha}{1/x-\alpha} + \frac{\beta}{1/x-\beta} + \frac{\gamma}{1/x-\gamma}\right)$ (d) $\frac{y}{x}\left(\frac{\alpha/x}{1/x-\alpha} + \frac{\beta/x}{1/x-\beta} + \frac{\gamma/x}{1/x-\gamma}\right)$

13. If $f(x) = \sqrt{\frac{1+\sin^{-1}x}{1-\tan^{-1}x}}$; then $f'(0)$ is equal to :

- (a) 4 (b) 3
(c) 2 (d) 1

14. Let $f(x) = \begin{cases} \sin^2 x & , \quad x \text{ is rational} \\ -\sin^2 x & , \quad x \text{ is irrational} \end{cases}$, then set of points, where $f(x)$ is continuous, is :

- (a) $\left\{(2n+1)\frac{\pi}{2}, n \in I\right\}$ (b) a null set
(c) $\{n\pi, n \in I\}$ (d) set of rational numbers

15. The number of values of x in $(0, 2\pi)$ where the function $f(x) = \frac{\tan x + \cot x}{2} - \left|\frac{\tan x - \cot x}{2}\right|$ is continuous but non-derivable :

- (a) 3 (b) 4
(c) 0 (d) 1

16. If $f(x) = |x - 1|$ and $g(x) = f(f(f(x)))$, then $g'(x)$ is equal to :

- (a) 1 for $x > 2$ (b) 1 for $2 < x < 3$
(c) -1 for $2 < x < 3$ (d) -1 for $x > 3$

17. If $f(x)$ is a continuous function $\forall x \in R$, then the least positive integral value of C is : (where $[.]$ denotes the greatest integer function.)

- (a) 3 (b) 5
(c) 6 (d) 7

18. If $y = x + e^x$, then $\left(\frac{d^2x}{dy^2}\right)_{x=\ln 2}$ is :

- (a) $-\frac{1}{9}$ (b) $-\frac{2}{27}$
(c) $\frac{2}{27}$ (d) $\frac{1}{9}$

19. Let $f(x) = x^3 + 4x^2 + 6x$ and $g(x)$ be its inverse then the value of $g'(-4)$:

- (a) -2 (b) 2
(c) $\frac{1}{2}$ (d) None of these

20. If $f(x) = 2 + |x| - |x - 1| - |x + 1|$, then $f'\left(-\frac{1}{2}\right) + f'\left(\frac{1}{2}\right) + f'\left(\frac{3}{2}\right) + f'\left(\frac{5}{2}\right)$ is equal to:

- (a) 1 (b) -1
(c) 2 (d) -2

21. If $f(x) = \cos(x^2 - 4[x]); 0 < x < 1$, (where $[.]$ denotes greatest integer function) then $f'\left(\frac{\sqrt{\pi}}{2}\right)$ is equal to :

- (a) $-\sqrt{\frac{\pi}{2}}$ (b) $\sqrt{\frac{\pi}{2}}$
(c) 0 (d) $\sqrt{\frac{\pi}{4}}$

22. Let $g(x)$ be the inverse of $f(x)$ such that $f'(x) = \frac{1}{1+x^5}$, then $\frac{d^2(g(x))}{dx^2}$ is equal to:

- (a) $\frac{1}{1+(g(x))^5}$ (b) $\frac{g'(x)}{1+(g(x))^5}$
(c) $5(g(x))^4(1+(g(x))^5)$ (d) $1+(g(x))^5$

23. Let $f(x) = \begin{cases} \min(x, x^2) & x \geq 0 \\ \max(2x, x-1) & x < 0 \end{cases}$, then which of the following is not true?

- (a) $f(x)$ is not differentiable at $x = 0$
- (b) $f(x)$ is not differentiable at exactly two points
- (c) $f(x)$ is continuous everywhere
- (d) $f(x)$ is strictly increasing $\forall x \in \mathbb{R}$

24. If $f(x) = \lim_{n \rightarrow \infty} \left(\prod_{i=1}^n \cos \left(\frac{x}{2^i} \right) \right)$ then $f'(x)$ is equal to :

- (a) $\frac{\sin x}{x}$
- (b) $\frac{x}{\sin x}$
- (c) $\frac{x \cos x - \sin x}{x^2}$
- (d) $\frac{\sin x - x \cos x}{\sin^2 x}$

25. Let $f(x) = \begin{cases} \frac{1-\tan x}{4x-\pi} & x \neq \frac{\pi}{4} \\ \lambda & x = \frac{\pi}{4} \end{cases}; x \in \left[0, \frac{\pi}{2}\right)$. If $f(x)$ is continuous in $\left[0, \frac{\pi}{2}\right)$ then λ is equal to:

- (a) 1
- (b) $\frac{1}{2}$
- (c) $-\frac{1}{2}$
- (d) -1

26. Let $f(x) = \begin{cases} e^{-\frac{1}{x^2} \sin \frac{1}{x}} & x \neq 0 \\ 0 & x = 0 \end{cases}$, then $f'(0) =$

- (a) 1
- (b) -1
- (c) 0
- (d) Does not exist

27. Let f be a differentiable function satisfying $f'(x) = 2f(x) + 10 \forall x \in \mathbb{R}$ and $f(0) = 0$, then the number of real roots of the equation $f(x) + 5\sec^2 x = 0$ in $(0, 2\pi)$ is :

- (a) 0
- (b) 1
- (c) 2
- (d) 3

28. If $f(x) = \begin{cases} \frac{\sin\{\cos x\}}{x - \frac{\pi}{2}} & x \neq \frac{\pi}{2} \\ 1 & x = \frac{\pi}{2} \end{cases}$, where $\{k\}$ represents the fractional part of k , then:

(a) $f(x)$ is continuous at $x = \frac{\pi}{2}$

(b) $\lim_{x \rightarrow \frac{\pi}{2}} f(x)$ does not exist

(c) $\lim_{x \rightarrow \frac{\pi}{2}} f(x)$ exists, but f is not continuous at $x = \frac{\pi}{2}$

(d) $\lim_{x \rightarrow \frac{\pi}{2}} f(x) = 1$

29. Let $f(x)$ be a polynomial in x . The second derivative of $f(e^x)$ w.r.t. x is :

(a) $f''(e^x)e^x + f'(e^x)$

(b) $f''(e^x)e^{2x} + f'(e^x)e^{2x}$

(c) $f''(e^x)e^x + f'(e^x)e^{2x}$

(d) $f''(e^x)e^{2x} + e^x f'(e^x)$

30. If $e^{f(x)} = \log_e x$ and $g(x)$ is the inverse function of $f(x)$, then $g'(x)$ is equal to:

(a) $e^x + x$

(b) $e^{e^x} e^{e^x} e^x$

(c) $e^{e^x + x}$

(d) e^{e^x}

31. If $y = f(x)$ is differentiable $\forall x \in \mathbb{R}$, then

(a) $y = |f(x)|$ is differentiable $\forall x \in \mathbb{R}$

(b) $y = f^2(x)$ is non-differentiable for atleast one x

(c) $y = f(x)|f(x)|$ is non-differentiable for atleast one x

(d) $y = |f(x)|^3$ is differentiable $\forall x \in \mathbb{R}$

32. If $f(x) = (x-1)^4(x-2)^3(x-3)^2$ then the value of $f(1)+f(2) + f'(3)$ is:

(a) 0

(b) 1

(c) 2

(d) 6

33. If $f(x) = \left(\frac{x}{2}\right) - 1$, then on the interval $[0, \pi]$:

- (a) $\tan(f(x))$ and $\frac{1}{f(x)}$ are both continuous
- (b) $\tan(f(x))$ and $\frac{1}{f(x)}$ are both discontinuous
- (c) $\tan(f(x))$ and $f^{-1}(x)$ are both continuous
- (d) $\tan(f(x))$ and but $f^{-1}(x)$ is not

34. Let $f(x) = \begin{cases} \frac{1}{e^{x-2}-3} & x > 2 \\ \frac{1}{3^{x-2}+1} & x < 2 \\ \frac{b \sin\{-x\}}{\{-x\}} & x < 2 \\ c & x = 2 \end{cases}$ where $\{.\}$ denotes fraction part function, is

continuous at $x = 2$, then $b + c =$

- (a) 0
- (b) 1
- (c) 2
- (d) 4

35. Let $f(x) = \frac{e^{\tan x} - e^x + \ln(\sec x + \tan x) - x}{\tan x - x}$ be a continuous function at $x = 0$. The value of $f(0)$ equals :

- (a) $\frac{1}{2}$
- (b) $\frac{2}{3}$
- (c) $\frac{3}{2}$
- (d) 2

36. Let $f(x) = \begin{cases} (1 + ax)^{1/x} & x < 0 \\ b & x = 0 \\ \frac{(x+c)^{1/3}-1}{(x+1)^{1/2}} & x > 0 \end{cases}$, is continuous at $x = 0$, then $3(e^a + b + c)$ is

equal to :

- (a) 3
- (b) 6
- (c) 7
- (d) 8

37. If $\sqrt{x+y} + \sqrt{y-x} = 5$, then $\frac{d^2y}{dx^2} =$

- (a) $\frac{2}{5}$
- (b) $\frac{4}{25}$
- (c) $\frac{2}{25}$
- (d) $\frac{1}{25}$

38. If $f(x) = x^3 + x^4 + \log x$ and g is the inverse of f , then $g'(2)$ is:

- (a) 8 (b) $\frac{1}{8}$
(c) 2 (d) $\frac{1}{4}$

39. The number of points at which the function,

$$f(x) = \begin{cases} \min\{|x|, x^2\} \\ \min\{2x - 1, x^2\} \end{cases} \text{ if } x \in (-\infty, 1) \text{ otherwise}$$

is not differentiable is :

- (a) 0 (b) 1
(c) 2 (d) 3

40. If $f(x)$ is a function such that $f(x) + f'(x) = 0$ and $g(x) = (f(x))^2 + (f'(x))^2$ and $g(3) = 8$, then $g(8) =$

- (a) 0 (b) 3
(c) 5 (d) 8

41. Let f is twice differentiable on \mathbb{R} such that $f(0) = 1, f'(0) = 0$ and $f''(0) = -1$,

then for $a \in \mathbb{R}$, $\lim_{x \rightarrow \infty} \left(f\left(\frac{a}{\sqrt{x}}\right) \right)^x =$

- (a) e^{-a^2} (b) $e^{-\frac{a^2}{4}}$
(c) $e^{-\frac{a^2}{2}}$ (d) e^{-2a^2}

42. Let $f_1(x) = e^x$ and $f_{n+1}(x) = e^{f_n(x)}$ for any $n \geq 1, n \in \mathbb{N}$. Then for any fixed n , the value of $\frac{d}{dx} f_n(x)$ equals:

- (a) $f_n(x)$ (b) $f_n(x)f_{n-1}(x) \dots f_2(x)f_1(x)$
(c) $f_n(x)f_{n-1}(x)$ (d) $f_n(x)f_{n-1}(x) \dots f_2(x)f_1(x)e^x$

43. If $y = \tan^{-1} \left(\frac{x^{1/3} - a^{1/3}}{1 + x^{1/3} a^{1/3}} \right)$, $x > 0$, $a > 0$, then $\frac{dy}{dx}$ is :

(a) $\frac{1}{x^{2/3}(1+x^{2/3})}$

(b) $\frac{3}{x^{2/3}(1+x^{2/3})}$

(c) $\frac{1}{3x^{2/3}(1+x^{2/3})}$

(d) $\frac{1}{3x^{1/3}(1+x^{2/3})}$

44. The value of $k + f(0)$ so that $f(x) = \begin{cases} \frac{\sin(4k-1)x}{3x}, & x < 0 \\ \frac{\tan(4k+1)x}{5x}, & 0 < x < \frac{\pi}{2} \\ 1, & x = 0 \end{cases}$ can be made

continuous at $x = 0$ is :

(a) 1

(b) 2

(c) $\frac{5}{4}$

(d) 0

45. If $y = \tan^{-1} \left(\frac{x}{1 + \sqrt{1-x^2}} \right)$, $|x| \leq 1$, then $\frac{dy}{dx}$ at $\left(\frac{1}{2}\right)$ is :

(a) $\frac{1}{\sqrt{3}}$

(b) 3

(c) $\frac{\sqrt{3}}{2}$

(d) $\frac{2}{\sqrt{3}}$

46. Let $f(x) = \frac{e^{2x} \cos x - x \log_e(1+x) - x}{x^2}$, $x \neq 0$. If $f(x)$ is continuous at $x = 0$, then $f(0)$ is equal to :

(a) 2

(b) 1

(c) -1

(d) 2

47. A function $f(x) = \max(\sin x, \cos x, 1 - \cos x)$ is non-derivable for n values of $x \in [0, 2\pi]$. Then the value of n is :

(a) 2

(b) 1

(c) 3

(d) 4

48. Let g be the inverse function of a differentiable function f and $G(x) = \frac{1}{g(x)}$. If

$f(4) = 2$ and $f'(4) = \frac{1}{16}$, then the value of $(G'(2))^2$ equals to :

(a) 1

(b) 4

(c) 16

(d) 64

49. If $f(x) = \max. \left(x^4, x^2, \frac{1}{81}\right) \forall x \in [0, \infty)$, then the sum of the square of reciprocal of all the values of x where $f(x)$ is non-differentiable, is equal to :

- (a) 1 (b) 81
(c) 82 (d) $\frac{82}{81}$

50. If $f(x)$ is derivable at $x = 2$ such that $f(2) = 2$ and $f'(2) = 4$, then the value of $\lim_{h \rightarrow 0} \frac{1}{h^2}, (\ln(f(2 + h^2)) - \ln(f(2 - h^2)))$ is equal to :

- (a) 1 (b) 2
(c) 3 (d) 4

51. Let $f(x) = (x^2 - 3x + 2)|(x^3 - 6x^2 + 11x - 6)| + \left|\sin\left(x + \frac{\pi}{4}\right)\right|$.

Number of points at which the function $f(x)$ is non-differentiable in $[0, 2\pi]$, is:

- (a) 5 (b) 4
(c) 3 (d) 2

52. Let f and g be differentiable functions on \mathbb{R} (the set of all real numbers) such that $g(10) = 2 = g'(1)$ and $f'(0) = 4$. If $h(x) = f(2xg(x) + \cos \pi x - 3)$ then $h'(1)$ is equal to :

- (a) 28 (b) 24
(c) 32 (d) 18

53. If $f(x) = \frac{(x+1)^7 \sqrt{1+x^2}}{(x^2-x+1)^6}$, then the value of $f'(0)$ is equal to :

- (a) 10 (b) 11
(c) 13 (d) 15

54. **Statement-1** : The function $f(x) = \lim_{n \rightarrow \infty} \frac{\log_e(1+x) - x^{2n} \sin(2x)}{1+x^{2n}}$ is discontinuous at $x = 1$.

Statement-2 : L.H.L. = R. H. L $\neq f(1)$.

- (a) Statement-1 is true, Statement-2 is true and Statement-2 is correct explanation for Statement-1
- (b) Statement-1 is true, Statement-2 is true and Statement -2 is not the correct explanation for statement-1
- (c) Statement-1 is true, Statement-2 is false
- (d) Statement-1 is false, Statement-2 is true

55. If $f(x) = \begin{cases} x & ; \text{ if } x \text{ is rational} \\ 1-x & ; \text{ if } x \text{ is irrational} \end{cases}$, then number of points for $x \in \mathbb{R}$, where $y = f(f(x))$ is discontinuous is :

- (a) 0
- (b) 1
- (c) 2
- (d) Infinitely many

56. Number of point where $f(x) = \begin{cases} \max(|x^2 - x - 2|, x^2 - 3x) & ; x \geq 0 \\ \max(\ln(-x), e^x) & ; x < 0 \end{cases}$ is non-differentiable will be :

- (a) 1
- (b) 2
- (c) 3
- (d) None of these

57. If the function $f(x) = -4e^{\frac{1-x}{2}} + 1 + x + \frac{x^2}{2} + \frac{x^3}{3}$ and $g(x) = f^{-1}(x)$, then the value of $g'\left(\frac{-7}{6}\right)$ equals to :

- (a) $\frac{1}{5}$
- (b) $-\frac{1}{5}$
- (c) $\frac{6}{7}$
- (d) $-\frac{6}{7}$

58. Find k; if possible ; sot that

$$f(x) = \begin{cases} \frac{\ln(2-\cos 2x)}{\ln^2(1+\sin 3x)} & ; x < 0 \\ k & ; x = 0 \\ \frac{e^{\sin 2x}-1}{\ln(1+\tan 9x)} & ; x > 0 \end{cases}$$

is continuous at $x = 0$.

(a) $\frac{2}{3}$

(b) $\frac{1}{9}$

(c) $\frac{2}{9}$

(d) Not possible

59. Let $x = \frac{1+t}{t^3}$; $y = \frac{3}{2t^2} + \frac{2}{t}$ then the value of $\frac{dy}{dx} - x \left(\frac{dy}{dx}\right)^3$ is :

(a) 2

(b) 0

(c) -1

(d) -2

60. If $y^{-2} = 1 + 2\sqrt{2}\cos 2x$, then :

$\frac{d^2y}{dx^2} = y(py^2 + 1)(qy^2 - 1)$ then the value of $(p + q)$ equals to :

(a) 7

(b) 8

(c) 9

(d) 10

61. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ is not identically zero, differentiable function and satisfy the equations $f(xy) = f(x)f(y)$ and $f(x + z) = f(x) + f(z)$, then $f(5) =$

(a) 3

(b) 5

(c) 10

(d) 15

62. Number of points at which the function $f(x) =$

$$\begin{cases} \min. (x, x^2) & \text{if } -\infty < x < 1 \\ \min. (2x - 1, x^2) & \text{if } x \geq 1 \end{cases} \text{ is not derivable is :}$$

(a) 0

(b) 1

(c) 2

(d) 3

63. If $y = (x + \sqrt{1 + x^2})^n$, then $(1 + x^2) \frac{d^2y}{dx^2} + x \frac{dy}{dx}$ is :

- (a) n^2y (b) $-n^2y$
(c) $-y$ (d) $2x^2y$

64. If $g(x) = f(x - \sqrt{1 - x^2})$ and $f'(x) = 1 - x^2$ then $g'(x)$ equals to :

- (a) $1 - x^2$ (b) $\sqrt{1 - x^2}$
(c) $2x(x + \sqrt{1 - x^2})$ (d) $2x(x - \sqrt{1 - x^2})$

65. Let $f(x) = \lim_{n \rightarrow \infty} \frac{\log_e(2+x) - x^{2n} \sin x}{1 + x^{2n}}$ then :

- (a) $f(x)$ is continuous at $x = 1$ (b) $\lim_{x \rightarrow 1^-} f(x) = \log_e 3$
(c) $\lim_{x \rightarrow 1^-} f(x) = -\sin 1$ (d) $\lim_{x \rightarrow 1^-} f(x)$ does not exist

66. Let $f(x + y) = f(x)f(y)$ for all x and y , and $f(5) = -2, f'(0) = 3$, then $f'(5)$ is equal to :

- (a) 3 (b) 1
(c) -6 (d) 6

67. Let $f(x) = \lim_{n \rightarrow \infty} \frac{\log_e(2+x) - x^{2n} \sin x}{1 + x^{2n}}$ then :

- (a) $f(x)$ is continuous at $x = 1$ (b) $\lim_{x \rightarrow 1^+} f(x) = \log_e 3$
(c) $\lim_{x \rightarrow 1^+} f(x) = -\sin 1$ (d) $\lim_{x \rightarrow 1^-} f(x)$ does not exist

68. If $f(x) = \begin{cases} \frac{x - e^x + 1 - \{1 - \cos 2x\}}{x^2} & x \neq 0 \\ k & x = 0 \end{cases}$ is continuous at $x = 0$ then, which of the following statement is false ?

- (a) $k = \frac{-5}{2}$ (b) $\{k\} = \frac{1}{2}$
(c) $[k] = -2$ (d) $[k][k] = \frac{-3}{2}$

(where $[.]$ denotes greatest integer function and $\{.\}$ denotes fraction part function.)

69. Let $f(x) = ||x^2 - 10x + 21| - p|$; then the exhaustive set of values of p for which $f(x)$ has exactly 6 points of non-derivability; is :

- (a) $(4, \infty)$ (b) $(0, 4)$
(c) $[0, 4]$ (d) $(-4, 4)$

70. If $f(x) = \sqrt{\frac{1+\sin^{-1}x}{1-\tan^{-1}x}}$; then $f'(0)$ is equal to :

- (a) 4 (b) 3
(c) 2 (d) 1

71. For $t \in (0, 1)$; let $x = \sqrt{2^{\sin^{-1}t}}$ and $y = \sqrt{2^{\cos^{-1}t}}$, then $1 + \left(\frac{dy}{dx}\right)^2$ equals :

- (a) $\frac{x^2}{y^2}$ (b) $\frac{y^2}{x^2}$
(c) $\frac{x^2+y^2}{y^2}$ (d) $\frac{x^2+y^2}{x^2}$

72. Let $f(x) = -1 + |x - 2|$ and $g(x) = 1 - |x|$ then set of all possible value (s) of x for which $(f \circ g)(x)$ is discontinuous is :

- (a) $\{0, 1, 2\}$ (b) $\{0, 2\}$
(c) $\{0\}$ (d) an empty set

73. If $f(x) = [x] \tan(\pi x)$ then $f'(K^+)$ is equal to ($k \in I$ and $[.]$ denotes greatest integer function) :

- (a) $(k - 1)\pi(-1)^k$ (b) $k\pi$
(c) $k\pi(-1)^{k+1}$ (d) $(k - 1)\pi(-1)^{k+1}$

74. If $f(x) = \begin{cases} \frac{ae^{\sin x} + be^{-\sin x}}{x^2} & ; x \neq 0 \\ 2 & ; x = 0 \end{cases}$ is continuous at $x = 0$; then :

- (a) $a = b = c$ (b) $a = 2b = 3c$
(c) $a = b = 2c$ (d) $2a = 2b = c$

75. If $\tan x \cdot \cot y = \sec \alpha$ where α is constant and $\alpha \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ then $\frac{d^2y}{dx^2}$ at $\left(-\frac{\pi}{4}, \frac{\pi}{4}\right)$ equals to :
- (a) 0 (b) 1
(c) 2 (d) 3
76. If $y = (x - 3)(x - 2)(x - 1) \times (x + 1)(x + 2)(x + 3)$, then $\frac{d^2y}{dx^2}$ at $x = 1$ is :
- (a) -101 (b) 48
(c) 56 (d) 190
77. Let $f(x + y) = f(x)f(y) \forall x, y \in \mathbb{R}, f(0) \neq 0$. If $f(x)$ is continuous at $x = 0$, then $f(x)$ is continuous at:
- (a) all natural number only (b) all integers only
(c) all rational number only (d) all real numbers
78. If $f(x) = 3x^9 - 2x^4 + 2x^3 - 3x^2 + x + \cos x + 5$ and $g(x) = f^{-1}(x)$; then the value of $g'(6)$ equals :
- (a) 1 (b) $\frac{1}{2}$
(c) 2 (d) 3
79. If $y = f(x)$ and $z = g(x)$ then $\frac{d^2y}{dz^2}$ equals
- (a) $\frac{g'f'' - f'g''}{(g')^2}$ (b) $\frac{g'f'' - f'g''}{(g')^3}$
(c) $\frac{f'g'' - g'f''}{(g')^3}$ (d) None of these
80. Let $f(x) = \begin{cases} x + 1 & ; x < 0 \\ |x - 1| & ; x \geq 0 \end{cases}$ and $g(x) = \begin{cases} x + 1 & ; x < 0 \\ (x - 1)^2 & ; x \geq 0 \end{cases}$ then the number of points where $g(f(x))$ is not differentiable.
- (a) 0 (b) 1
(c) 2 (d) None of these

81. Let $f(x) = [\sin x] + [\cos x]$, $x \in [0, 2\pi]$, where $[.]$ denotes the greatest integer function, total number of points where $f(x)$ is non differentiable is equal to :

- (a) 2 (b) 3
(c) 4 (d) 5

82. Let $f(x) = \cos x$, $g(x) = \begin{cases} \min\{f(t): 0 \leq t \leq x\} & , \quad x \in [0, \pi] \\ (\sin x) - 1 & , \quad x > \pi \end{cases}$

Then

- (a) $g(x)$ is discontinuous at $x = \pi$ (b) $g(x)$ is continuous for $x \in [0, \infty)$
(c) $g(x)$ is differentiable at $x = \pi$ (d) $g(x)$ is differentiable for $x \in [0, \infty)$

83. If $f(x) = (4 + x)^n$, $n \in \mathbb{N}$ and $f^r(0)$ represents the r^{th} derivative of $f(x)$ at $x = 0$, then the value of $\sum_{r=0}^{\infty} \frac{f^r(0)}{r!}$ is equal to :

- (a) 2^n (b) 3^n
(c) 5^n (d) 4^n

84. Let $f(x) = \begin{cases} \frac{x}{1+|x|} & , \quad |x| \geq 1 \\ \frac{x}{1-|x|} & , \quad |x| < 1 \end{cases}$, then domain of $f'(x)$ is :

- (a) $(-\infty, \infty)$ (b) $(-\infty, \infty) - \{-1, 0, 1\}$
(c) $(-\infty, \infty) - \{-1, 1\}$ (d) $(-\infty, \infty) - \{0\}$

85. If the function $f(x) = -4e^{\frac{1-x}{2}} + 1 + x + \frac{x^2}{2} + \frac{x^3}{3}$ and $g(x) = f^{-1}(x)$, then the value of $g'\left(\frac{-7}{6}\right)$ equals :

- (a) $\frac{1}{5}$ (b) $-\frac{1}{5}$
(c) $\frac{6}{7}$ (d) $-\frac{6}{7}$

86. The number of points at which the function $f(x) = (x - |x|)^2(1 - x + |x|)^2$ is not differentiable in the interval $(-3, 4)$ is :

- (a) Zero (b) One
(c) Two (d) Three

87. If $f(x) = \sqrt{\frac{1+\sin^{-1}x}{1-\tan^{-1}x}}$; then $f'(0)$ is equal to:

- (a) 4 (b) 3
(c) 2 (d) 1

88. If $f(x) = \begin{cases} e^{x-1} & ; 0 \leq x \leq 1 \\ x+1-\{x\} & ; 1 < x < 3 \end{cases}$ and $g(x) = x^2 - ax + b$ such that $f(x)g(x)$ is continuous in $[0, 3)$ then the ordered pair (a, b) is (where $\{.\}$ denotes fractional part function):

- (a) (2, 3) (b) (1, 2)
(c) (3, 2) (d) (2, 2)

89. Use the following table and the fact that $f(x)$ is invertible and differentiable everywhere to find $f^{-1}(3)$:

x	f(x)	f'(x)
3	1	7
6	2	10
9	3	5

- (a) 0 (b) $\frac{1}{5}$
(c) $\frac{1}{10}$ (d) $\frac{1}{7}$

90. Let $f(x) = \begin{cases} x^n \sin \frac{1}{x} & , x \neq 0 \\ 0 & , x = 0 \end{cases}$

Such that $f(x)$ is continuous at $x = 0$; $f'(0)$ is real and finite; and $\lim_{x \rightarrow 0} f'(x)$ does not exist. This holds true for which of the following values of ?

- (a) 0 (b) 1
(c) 2 (d) 3

Answer

1.	(a)	2.	(d)	3.	(a)	4.	(b)	5.	(c)	6.	(a)	7.	(c)	8.	(c)	9.	(a)	10.	(a)
11.	(a)	12.	(b)	13.	(d)	14.	(c)	15.	(b)	16.	(c)	17.	(c)	18.	(b)	19.	(c)	20.	(d)
21.	(a)	22.	(c)	23.	(b)	24.	(c)	25.	(c)	26.	(c)	27.	(a)	28.	(b)	29.	(d)	30.	(c)
31.	(d)	32.	(a)	33.	(c)	34.	(a)	35.	(c)	36.	(c)	37.	(c)	38.	(b)	39.	(b)	40.	(d)
41.	(c)	42.	(b)	43.	(c)	44.	(b)	45.	(a)	46.	(a)	47.	(c)	48.	(a)	49.	(c)	50.	(d)
51.	(c)	52.	(c)	53.	(c)	54.	(c)	55.	(a)	56.	(c)	57.	(a)	58.	(c)	59.	(c)	60.	(d)
61.	(b)	62.	(b)	63.	(a)	64.	(c)	65.	(c)	66.	(c)	67.	(c)	68.	(c)	69.	(b)	70.	(d)
71.	(d)	72.	(d)	73.	(b)	74.	(d)	75.	(a)	76.	(c)	77.	(d)	78.	(a)	79.	(b)	80.	(c)
81.	(d)	82.	(b)	83.	(c)	84.	(c)	85.	(a)	86.	(a)	87.	(d)	88.	(c)	89.	(b)	90.	(c)

Exercise-2: One or More than One Answer is/are Correct

1. If $f(x) = \tan^{-1}(\operatorname{sgn}(x^2 - \lambda x + 1))$ has exactly one point of discontinuity, then the value of λ can be :
- (a) 1 (b) -1
(c) 2 (d) -2

2. $f(x) = \begin{cases} 2(x+1) & ; \quad x \leq -1 \\ \sqrt{1-x^2} & ; \quad -1 < x < 1, \text{ then :} \\ ||x| - 1| - 1| & ; \quad x \geq 1 \end{cases}$

- (a) $f(x)$ is non-differentiable at exactly three points
(b) $f(x)$ is continuous in $(-\infty, 1]$
(c) $f(x)$ is differentiable in $(-\infty, -1)$
(d) $f(x)$ is finite type of discontinuity at $x = 1$, but continuous at $x = -1$

3. Let $f(x) = \begin{cases} \frac{x(3e^{1/x} + 4)}{2 - e^{1/x}} & ; \quad x \neq 0 \quad x \neq \frac{1}{\ln 2} \\ 0 & ; \quad x = 0 \end{cases}$

which of the following statement (s) is/are correct ?

- (a) $f(x)$ is continuous at $x = 0$ (b) $f(x)$ is non-derivable at $x = 0$
(c) $f'(0^+) = -3$ (d) $f'(0^-)$ does not exist

4. Let $|f(x)| \leq \sin^2 x, \forall x \in \mathbb{R}$, then
- (a) $f(x)$ is continuous at $x = 0$
(b) $f(x)$ is differentiable at $x = 0$
(c) $f(x)$ is continuous but not differentiable at $x = 0$
(c) $f(0) = 0$

$$5. \text{ Let } f(x) = \begin{cases} \frac{a(1-x \sin x) + b \cos x + 5}{x^2} & ; x < 0 \\ 3 & ; x = 0 \\ \left(1 + \left(\frac{cx + dx^3}{x^2}\right)\right)^{\frac{1}{x}} & ; x > 0 \end{cases}$$

If f is continuous at $x = 0$ then correct statement(s) is/are :

- (a) $a + c = -1$ (b) $b + c = -4$
(c) $a + b = -5$ (d) $c + d = \text{an irrational number}$

6. If $f(x) = ||x| - 2| + p$ have more than 3 points of non-derivability then the value of p can be :

- (a) 0 (b) -1
(c) -2 (d) 2

7. Identify the options having correct statements :

- (a) $f(x) = \sqrt[3]{x^2|x|} - 1 - |x|$ is no where non-differentiable
(b) $\lim_{x \rightarrow \infty} ((x+5)\tan^{-1}(x+1)) - ((x+1)\tan^{-1}(x+1)) = 2\pi$
(c) $f(x) = \sin(\ln(x + \sqrt{x^2 + 1}))$ is an odd function
(d) $f(x) = \frac{4-x^2}{4x-x^3}$ is discontinuous at exactly one point

8. A twice differentiable function $f(x)$ is defined for all real number and satisfies the following conditions :

$$f(0) = 2; \quad f'(0) = -5 \text{ and } f''(0) = 3.$$

The function $g(x)$ is defined by $g(x) = e^{ax} + f(x) \forall x \in \mathbb{R}$, where 'a' is any constant. If $g'(0) + g''(0) = 0$ then 'a' can be equal to :

- (a) 1 (b) -1
(c) 2 (d) -2

9. If $f(x) = |x| \sin x$, then f is :

- (a) differentiable everywhere (b) not differentiable at $x = n\pi, n \in \mathbb{I}$
(c) not differentiable at $x = 0$ (d) continuous at $x = 0$

10. Let $[]$ denotes the greatest integer function and $f(x) = [\tan^2 x]$, then
 (a) $\lim_{x \rightarrow 0} f(x)$ does not exist (b) $f(x)$ is continuous at $x = 0$
 (c) $f(x)$ is not differentiable at $x = 0$ (d) $f'(0) = 0$
11. Let f be a differentiable function satisfying $f'(x) = f'(-x) \forall x \in \mathbb{R}$. Then
 (a) If $f(1) = f(2)$, then $f(-1) = f(-2)$
 (b) $\frac{1}{2}f(x) + \frac{1}{2}f(y) = f\left(\frac{1}{2}(x+y)\right)$ for all real values of x, y
 (c) Let $f(x)$ be an even function, then $f(x) = 0 \forall x \in \mathbb{R}$
 (d) $f(x) + f(-x) = 2f(0) \forall x \in \mathbb{R}$
12. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a function, such that $|f(x)| \leq x^{4n}, n \in \mathbb{N} \forall x \in \mathbb{R}$ then $f(x)$ is :
 (a) discontinuous at $x = 0$ (b) continuous at $x = 0$
 (c) non-differentiable at $x = 0$ (d) differentiable at $x = 0$
13. Let $f(x) = [x]$ and $g(x) = 0$ when x is an integer and $g(x) = x^2$ when x is not an integer ($[]$ is the greatest integer function) then :
 (a) $\lim_{x \rightarrow 1} g(x)$ exists, but $g(x)$ is not continuous at $x = 1$
 (b) $\lim_{x \rightarrow 1} f(x)$ does not exist
 (c) $g \circ f$ is continuous for all x
 (d) $f \circ g$ is continuous for all x
14. Let the function f be defined by $f(x) = \begin{cases} p + qx + x^2 & , \quad x < 2 \\ 2px + 3qx^2 & , \quad x \geq 2 \end{cases}$. Then :
 (a) $f(x)$ is continuous in \mathbb{R} if $3p + 10q = 4$
 (b) $f(x)$ is differentiable in \mathbb{R} if $p = q = \frac{4}{13}$
 (c) If $p = -2, q = 1$, then $f(x)$ is continuous in \mathbb{R}
 (d) $f(x)$ is differentiable in \mathbb{R} if $2p + 11q = 4$
15. Let $f(x) = |2x - 9| + |2x| + |2x + 9|$. Which of the following are true ?
 (a) $f(x)$ is not differentiable at $x = \frac{9}{2}$
 (b) $f(x)$ is not differentiable at $x = \frac{-9}{2}$
 (c) $f(x)$ is not differentiable at $x = 0$
 (d) $f(x)$ is differentiable at $x = \frac{-9}{2}, 0, \frac{9}{2}$

16. Let $f(x) = \max(x, x^2, x^3)$ in $-2 \leq x \leq 2$. Then :
- $f(x)$ is continuous in $-2 \leq x \leq 2$
 - $f(x)$ is not differentiable at $x = 1$
 - $f(-1) + f\left(\frac{3}{2}\right) = \frac{35}{8}$
 - $f'(-1) + f'\left(\frac{3}{2}\right) = \frac{-35}{8}$
17. If $f(x)$ be a differentiable function satisfying $f(y)f\left(\frac{x}{y}\right) = f(x) \forall x, y \in \mathbb{R}, y \neq 0$ and $f(1) \neq 0, f'(1) = 3$, then
- $\text{sgn}(f(x))$ is non-differentiable at exactly one point
 - $\lim_{x \rightarrow 0} \frac{x^2(\cos x - 1)}{f(x)} = 0$
 - $f(x) = x$ has 3 solutions
 - $f(f(x)) - f^3(x) = 0$ has infinitely many solutions
18. Let $f(x) = (x^2 - 3x + 2)(x^2 + 3x + 2)$ and α, β, γ satisfy $\alpha < \beta < \gamma$ are the roots of $f'(x) = 0$ then which of the following is/are correct [.] denotes greatest integer function) ?
- $[\alpha] = -2$
 - $[\beta] = -1$
 - $[\beta] = 0$
 - $[\alpha] = 1$
19. Let the function f be defined by $f(x) = \begin{cases} p + qx + x^2, & x < 2 \\ 2px + 3qx^2, & x \geq 2 \end{cases}$. Then :
- $f(x)$ is continuous in \mathbb{R} if $3p + 10q = 4$
 - $f(x)$ is differentiable in \mathbb{R} if $p = q = \frac{4}{13}$
 - If $p = -2, q = 1$, then $f(x)$ is continuous in \mathbb{R}
 - $f(x)$ is differentiable in \mathbb{R} if $2p + 11q = 4$
20. If $y = e^{x \sin(x^3)} + (\tan x)^x$ then $\frac{dy}{dx}$ may be equal to :
- $e^{x \sin(x^3)}[3x^3 \cos(x^3) + \sin(x^3)] + (\tan x)^x [\ln \tan x + 2x \operatorname{cosec} 2x]$
 - $e^{x \sin(x^3)}[x^3 \cos(x^3) + \sin(x^3)] + (\tan x)^x [\ln \tan x + 2x \operatorname{cosec} 2x]$
 - $e^{x \sin(x^3)}[3x^3 \sin(x^3) + \cos(x^3)] + (\tan x)^x [\ln \tan x + 2x \operatorname{cosec} 2x]$
 - $e^{x \sin(x^3)}[3x^3 \cos(x^3) + \sin(x^3)] + (\tan x)^x \left[\ln \tan x + \frac{x \sec^2 x}{\tan x} \right]$

21. Let $f(x) = x + (1-x)x^2 + (1-x)(1-x^2)x^3 + \dots + (1-x)(1-x^2)\dots(1-x^{n-1})x^n$; ($n \geq 4$) then :

- (a) $f(x) = -\prod_{r=1}^n (1-x^r)$
 (b) $f(x) = 1 - \prod_{r=1}^n (1-x^r)$
 (c) $f'(x) = (1-f(x)) \left(\sum_{r=1}^n \frac{r x^{r-1}}{(1-x^r)} \right)$
 (d) $f'(x) = f(x) \left(\sum_{r=1}^n \frac{r x^{r-1}}{(1-x^r)} \right)$

22. Let $f(x) = \begin{cases} x^2 + a; & 0 \leq x < 1 \\ 2x + b; & 1 \leq x \leq 2 \end{cases}$ and $g(x) = \begin{cases} 3x + b; & 0 \leq x < 1 \\ x^3; & 1 \leq x \leq 2 \end{cases}$

If derivative of $f(x)$ w.r.t. $g(x)$ at $x = 1$ exists and is equal to λ , then which of the following is/are correct ?

- (a) $a + b = -3$ (b) $a - b = 1$
 (c) $\frac{ab}{\lambda} = 3$ (d) $\frac{-b}{\lambda} = 3$

23. If $f(x) = \begin{cases} \frac{\sin[x^2]\pi}{x^2-3x+8} + ax^3 + b; & 0 \leq x \leq 1 \\ 2 \cos \pi x + \tan^{-1} x; & 1 < x \leq 2 \end{cases}$ is differentiable in $[0, 2]$ then :

([.] denotes greatest integer function)

- (a) $a = \frac{1}{3}$ (b) $a = \frac{1}{6}$
 (c) $b = \frac{\pi}{4} - \frac{13}{6}$ (d) $b = \frac{\pi}{4} - \frac{7}{3}$

24. If $f(x) = \begin{cases} 1+x & 0 \leq x \leq 2 \\ 3-x & 2 < x \leq 3 \end{cases}$, then $f(f(x))$ is not differentiable at :

- (a) $x = 1$ (b) $x = 2$
 (c) $x = \frac{5}{2}$ (d) $x = 3$

25. Let $f(x) = (x+1)(x+2)(x+3)\dots(x+100)$ and $g(x) = f(x)f''(x) - (f'(x))^2$.

Let n be the number of real roots of $g(x) = 0$, then :

- (a) $x < 2$ (b) $n > 2$
 (c) $n < 100$ (d) $n > 100$

26. If $f(x) = \begin{cases} |x| - 3 & , \quad x < 1 \\ |x - 2| + a & , \quad x \geq 1 \end{cases}$, $g(x) = \begin{cases} 2 - |x| & , \quad x < 2 \\ \text{sgn}(x) - b & , \quad x \geq 2 \end{cases}$

If $h(x) = f(x) + g(x)$ is discontinuous at exactly one point, then which of the following are correct ?

(a) $a = -3, b = 0$

(b) $a = -3, b = -1$

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

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

27. Let $f(x)$ be a continuous function in $[-1, 1]$ such that

$$f(x) = \begin{cases} \frac{\ln(ax^2+bx+c)}{x^2} & ; \quad -1 \leq x < 0 \\ 1 & ; \quad x = 0 \\ \frac{\sin(e^{x^2}-1)}{x^2} & ; \quad 0 < x \leq 1 \end{cases}$$

Then which of the following is/are correct ?

(a) $a + b + c = 0$

(b) $b = a + c$

(c) $c = 1 + b$

(d) $b^2 + c^2 = 1$

28. $f(x)$ is differentiable function satisfying the relationship

$$f^2(x) + f^2(y) + 2(xy - 1) = f^2(x + y) \quad \forall x, y \in \mathbb{R}$$

Also $f(x) > 0 \quad \forall x \in \mathbb{R}$ and $f(\sqrt{2}) = 2$. Then which of the following statement(s) is/are correct about $f(x)$?

(a) $[f(3)] = 3$ ([.] denotes greatest integer function)

(b) $f(\sqrt{7}) = 3$

(c) $f(x)$ is even

(d) $f'(0) = 0$

29. The function $f(x) = \left[\sqrt{1 - \sqrt{1 - x^2}} \right]$, (where [.] denotes greatest integer function) :

(a) has domain $[-1, 1]$

(b) is discontinuous at two points in its domain

(c) is discontinuous at $x = 0$

(d) is discontinuous at $x = 1$

30. A function $f(x)$ satisfies the relation :

$f(x+y) = f(x) + f(y) + xy(x+y) \forall x, y \in \mathbb{R}$. If $f'(0) = -1$, then :

- (a) $f(x)$ is a polynomial function
- (b) $f(x)$ is an exponential function
- (c) $f(x)$ is an exponential function
- (d) $f'(3) = 8$

31. The points of discontinuities of $f(x) = \left[\frac{6x}{\pi}\right] \cos \left[\frac{3x}{\pi}\right]$ in $\left[\frac{\pi}{6}, \pi\right]$ is/are L

(where $[.]$ denotes greatest integer function)

- (a) $\frac{\pi}{6}$
- (b) $\frac{\pi}{3}$
- (c) $\frac{\pi}{2}$
- (d) π

32. Let $f(x) = \begin{cases} \frac{x^2}{2} & 0 \leq x < 1 \\ 2x^2 - 3x + \frac{3}{2} & 1 \leq x \leq 2 \end{cases}$ then in $[0, 2]$:

- (a) $f(x), f'(x)$ are continuous
- (b) $f'(x)$ is continuous for all x
- (c) f is continuous everywhere
- (d) f is not continuous everywhere

33. If $x = \phi(t), y = \Psi(t)$, then $\frac{d^2x}{dx^2} =$

- (a) $\frac{\phi'\Psi'' - \Psi'\phi''}{(\phi')^2}$
- (b) $\frac{\phi'\Psi'' - \Psi'\phi''}{(\phi')^3}$
- (c) $\frac{\Psi''}{\phi'} - \frac{\Psi'\phi''}{(\phi')^2}$
- (d) $\frac{\Psi''}{(\phi')^2} - \frac{\Psi'\phi''}{(\phi')^3}$

34. $f(x) = [x]$ and $g(x) = \begin{cases} 0 & , \quad x \in \mathbb{I} \\ x^2 & , \quad x \notin \mathbb{I} \end{cases}$ where $[.]$ denotes the greatest integer function. Then

- (a) $g \circ f$ is continuous for all x
- (b) $g \circ f$ is not continuous for all x
- (c) $f \circ g$ is continuous everywhere
- (d) $f \circ g$ is not continuous everywhere

35. Let $f: \mathbb{R}^+ \rightarrow \mathbb{R}$ defined as $f(x) = e^x + \ln x$ and $g = f^{-1}$ then correct statement (s) is/are :

(a) $g''(e) = \frac{1-e}{(1+e)^3}$

(b) $g''(e) = \frac{e-1}{(1+e)^3}$

(c) $g'(e) = e + 1$

(d) $g'(e) = \frac{1}{e+1}$

36. Let $f(x) = \begin{cases} \frac{3x-x^2}{2} & ; \quad x < 2 \\ [x-1] & ; \quad 2 \leq x < 3 \\ x^2 - 8x + 17 & ; \quad x \geq 3 \end{cases}$; then which of the following holds(s)

good ?

([.] denotes greatest integer function)

(a) $\lim_{x \rightarrow 2} f(x) = 1$

(b) $f(x)$ is differentiable at $x = 2$

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

(d) $f(x)$ is discontinuous at $x = 3$

Answers

1.	(c, d)	2.	(a, c, d)	3.	(a, b, c)	4.	(a, b, d)	5.	(a, b, c, d)	6.	(b, c)
7.	(a, b, c)	8.	(a, d)	9.	(a, d)	10.	(b, d)	11.	(a, d)	12.	(b, d)
13.	(a, b, c)	14.	(a, b, c)	15.	(a, b, c)	16.	(a, b, c)	17.	(a, b, c, d)	18.	(a, c)
19.	(a, b, c)	20.	(a, d)	21.	(b, c)	22.	(a, b, c, d)	23.	(b, c)	24.	(a, b)
25.	(a, c)	26.	(a, b, c, d)	27.	(c, d)	28.	(a, b, c, d)	29.	(a, b, d)	30.	(a, c, d)
31.	(b, c)	32.	(a, b, d)	33.	(b, d)	34.	(a)	35.	(a, d)	36.	(a, c, d)