CHAPTER 5

CONTINUITY AND DIFFERENTIABILITY

TRUE- FALSE TYPE QUESTIONS

Sl.No.	Write True or False
1.	If f is differentiable then, $\frac{d}{dx}\left(f\sqrt{x}\right) = \frac{f'(x)}{2\sqrt{x}}$
2.	$\frac{d}{dx}10^x = x\,10^{x-1}$
3.	If $f(x) and\ g(x)$ are differentiable for all x then $\frac{d}{dx}(f(g(x)) = \frac{d}{dx}f'\left(g(x)\right)g'(x)$
4.	$\frac{d}{dx}\left(\frac{log x^2}{\log x}\right) = 0$
5.	If $f(x) = (1+x)(1+x^2)(1+x^3)(1+x^4)$, then $f'(0) = 4$
6.	$f(x) = \|x\|$ is differentiable for all x .
7.	If $w = f(x), x = g(y), y = h(z)$ then $\frac{dw}{dz} = \frac{dw}{dx}.\frac{dx}{dy}.\frac{dy}{dz}$
8.	If $y = a^x.b^{2x-1}$, then $\frac{d^2y}{dx^2} = y\log ab^2$
9.	$x = a\ cos\ ^4\theta, y = a\ sin^4\theta$, then $\frac{dy}{dx}$ at $\theta = \frac{3\pi}{1}\ is\ (-1)$
10.	Let $y = t^{10}+1\ and\ x = t^8+1$, then $\frac{d^2y}{dx^2}$ is equal to $20t^8$
11.	Let f(x) be a polynomial. Then , the second order derivative of f(e^x) is $f''(e^x)$
12.	If x =2at , y= at^2 where a is a constant then $\frac{d^2y}{dx^2}$ at x = $\frac{1}{2}$ is $\frac{1}{2a}$
13.	If y=e^{tanx} then (1- x^2)y_2 is equal to xy_1 + 2
14.	If y= ax^{n+1} +bx^{-n} and $x^2\frac{d^2y}{dx^2}$ = ky then value of k is n(n+1)
15.	If y =1-x+$\frac{x^2}{2!}-\frac{x^3}{3!}+\frac{x^4}{4!}$... then $\frac{d^2y}{dx^2}$ in terms of y is y
16.	If y= x + $e^x\ then\ \frac{d^2x}{dy^2}$ is equal to - $-\frac{e^x}{(1+e^x)^3}$
17.	If x^my^n =$(x+y)^{m+n}$ then $\frac{dy}{dx}$ =$\frac{x}{y}$

18.	If y=$a^x + e^x + x^x + x^a$ $then$ $\frac{dy}{dx}$ $at\ x = a$ is 1 + log a
19.	If y= x^{x^x} then $\frac{dy}{dx}$ = $x^{x^x} x^x$ {(1+logx)logx +$\frac{1}{x}$}
20.	If y=$\frac{ax^2}{(x-a)(x-b)(x-c)} + \frac{bx}{(x-b)(x-c)} + \frac{c}{(x-c)}$ +1 then $\frac{dy}{dx}$ is $\frac{y}{x}\{\frac{a}{a-x} + \frac{b}{b-x} + \frac{c}{c-x}\}$
21.	Derivative of log_ax is equal to 1/x .
22.	Derivative of a^x is $a^x log_e a$.
23.	Differentiation of log sin x^2 is 2x cot x^2 .
24.	Differentiation of $e^{\tan 3x}$ is tan 3x $e^{\tan 3x}$.
25.	When $x = at^2$ and y = 2 at then $\frac{dy}{dx}$ is $\frac{1}{t}$.
26.	If x =3 sin t – sin 3t, y = 3 cos t – cos 3t then $\frac{dy}{dx}$ at $t = \frac{\pi}{3}$ is $\frac{-1}{\sqrt{3}}$.
27.	If y = tan x + sec x , then d^2y/dx^2 is sin x/(1- sin x)^2 .
28.	If $x^m y^n = (x+y)^{m+n}$ then d^2y/dx^2 is 0 .
29.	Differentiation of $e^{\sin x}$ is $e^{\sin x}$ cos x .
30.	Differentiation of e^{3x} is e^{3x} .
31.	Derivative of e^{-x} with respect to x is e^{-x}
32.	The value of $\frac{dy}{dx}$,when $y = a^x$ is $a^x log a$
33.	Derivative of log $logx$ is $\frac{x}{logx}$
34.	Derivative of y^2 with respect to x is $2y\frac{dy}{dx}$
35.	When the relation between two variables is expressed via third variable is then the third variable is called a parameter
36.	The value of $\frac{dy}{dx}$when $y = a(\theta + cos\theta), x = a(1 - cos\theta)$ is $tan\frac{\theta}{2}$
37.	The acceleration of a particle is expressed as $\frac{d^2s}{dt^2}$ when s is the distance and t is the time.
38.	Let $f(x) = logcosx, then\ f^{//}\left(\frac{\pi}{4}\right)$ is 1
39.	If $y = Asinx + Bcosx, then\ \frac{d^2y}{dx^2} - y = 0$
40.	Let $y = btan\theta, x = asec\theta$ then $\frac{dy}{dx}$ at $x = \frac{\pi}{2}$ is $\frac{b}{a}$
41.	If f(x) = 2x and g(x) = $\frac{x^2}{2} + 1$ then f(x) + g(x) is a discontinuous function.

42.	The function f(x) = $e^{\|x\|}$ is continuous and differentiable everywhere.
43.	The function f(x) = $\begin{cases} \frac{x^2-x-6}{x+2}, & if \quad x \neq -2 \\ -5, & if \quad x = -2 \end{cases}$ is continuous at x = -2.
44.	The point of discontinuity of the function f(x) = $\begin{cases} 2x+3, & if \quad x \leq 2 \\ 2x-3, & if \quad x > 2 \end{cases}$ is x = 2.
45.	The function f(x) = cot x is discontinuous on the set $\{x = n\pi : n \in Z\}$.
46.	The value of k for which f(x) = $\begin{cases} \frac{3x+4\tan x}{x}, & when \quad x \neq 0 \\ k, & when \quad x = 0 \end{cases}$ is 7.
47.	All the points of discontinuity of the function f defined by f(x) = $\begin{cases} 3, & if \quad 0 \leq x \leq 1 \\ 4, & if \quad 1 < x < 3 \\ 5, & if \quad 3 \leq x \leq 10 \end{cases}$ are 3 and 10.
48.	The relationship between a and b , so that the function f defined by f(x) = $\begin{cases} ax+1, & if \quad x \leq 3 \\ bx+3, & if \quad x > 3 \end{cases}$ is continuous at x = 3 is a = b + $\frac{2}{3}$.
49.	If y = (2 + 3 sin x) (3 – 2 cos x), then the value of $\frac{dy}{dx}$ is 4 sin x + 9 cos x – 6 cos 2x.
50.	The differential coefficient of sin (cos (x^2)) wrt x is – 2x sin (x^2) cos (cos x^2).
51.	$If\ x > 0, then\ (\log x)^5 = 5 \log x$
52.	$\frac{d}{dx}(10^x) = x(10^{x-1})$
53.	$log e^{x^2} = x^2, for\ all\ x$
54.	$If\ y = A \sin x + B \cos x\,, then\ \frac{d^2y}{dx^2} + y = 0$
55.	$If\ y = \log x\,, then\ \frac{d^2y}{dx^2} + \frac{1}{x^2} = 0$
56.	$If\ x = t + \cos t\,, y = \sin t\,, then\ \frac{d^2y}{dx^2} = \frac{1}{(1-\sin t)^2}$
57.	$If\ y = \tan^{-1} x\,, then\ \frac{d^2y}{dx^2} = -2cos^3 y . \sin y$
58	$If\ x^a x^b = (x+y)^{(a+b)}, then\ \frac{dy}{dx} = -\frac{y}{x}$
59	$If\ f(x) = x + \cot x\,, then\ the\ value\ of\ \frac{d^2y}{dx^2} = 4\ at\ x = \frac{\pi}{4}$

60	$If\ e^y(x+5)=1, then\ \frac{d^2y}{dx^2}=(\frac{dy}{dx})^2$
61	If $y=x^{x^{x^{\cdots\infty}}}$,then $\frac{dy}{dx}$ is equal to $\frac{y}{x(1+y\log x)}$
62	If $y=x^x$,then its derivative w.r.t, xlog x is x^x.
63	If a^x=N then$\log_a N$= x
64	The logarithm of any real number is defined.
65	The condition base a>0, a≠ $1\ and\ N>0$ is necessary in the definition of logarithm.
66	$\log_a(m+n)=\log_a m+\log_a n$
67	Logarithms to the base 10 are called Natural logarithms.
68	x^ymay be written as $e^{y\log x}$.
69	The second derivative of $\log_e x$ is $\frac{1}{x}$.
70	The derivative of $\log_a x$ is $\frac{1}{x}$.
71	Every continuous function is differentiable
72	Every differentiable function is continuous
73	Every polynomial function is differentiable
74	The logarithmic function is differentiable at each point in its domain
75	The composition of two differentiable function is a differentiable function
76	Trigonometric and inverse trigonometric functions are differentiable
77	The function $\|x-1\|$ is differentiable everywhere
78	The derivative of log(logx) is 1/x
79	The derivative of e^{-x} is e^{-x}
80	The double derivative of $5x^2$ is 10
81	The function $f(x)=e^{\|x\|}$ is differentiable every where
82	If $x=a\cos\theta, y=a\sin\theta$, then $\frac{d^2y}{dx^2}$ is independent of θ

83	The derivative of $\log_2 x$ is $\frac{1}{x\log 2}$
84	If $f(x)=e^{\log x^2}$, then $f^1(x)\big\|_{x=1}=4$
85	$\frac{d}{dx}\sin(\log x)=\frac{\cos(\log x)}{x}$
86	If $y=Ae^{\alpha x}+Be^{\beta x}$, then $\frac{d^2y}{dx^2}-(\alpha+\beta)\frac{dy}{dx}+\alpha\beta y=0$
87	If $y=\log(e^{\log x})$, then $\frac{dy}{dx}=\frac{1}{xe^{\log x}}$
88	If $x=a(\theta-\sin\theta),\ y=a(1+\cos\theta)$, then $\frac{dy}{dx}=-\cot\left(\frac{\theta}{2}\right)$
89	If $y=e^{x^x}$, then $\frac{dy}{dx}=yx^x(1+\log_e x)$
90	If $y=e^{x+e^{x+e^{x+\ldots\ldots\ldots to\infty}}}$, then $\frac{dy}{dx}=\frac{y}{1-y}$

ANSWER KEY

Question number	answers
Q.No.1	True
Q.No.2	False
Q.No.3	True
Q.No.4	True
Q.No.5	False
Q.No.6	False
Q.No.7	True
Q.No.8	False
Q.No.9	True
Q.No.10	False
11	False
12	True
13	True
14	True
15	True
16	True

17	False
18	False
19	True
20	True
21	False
22	True
23	True
24	False
25	True
26	True
27	False
28	True
29	True
30	False
31	False
32	True
33	False
34	True
35	True
36	False
37	True
38	False
39	False
40	True
41	FALSE
42	FALSE
43	TRUE
44	TRUE
45	TRUE
46	TRUE
47	FALSE
48	TRUE
49	TRUE
50	TRUE
51	False
52	False
53	True
54	True
55	True
56	True
57	True
58	False
59	True
60	True
61	(b)
62	(a)

63	(a)
64	(b)
65	(a)
66	(b)
67	(b)
68	(a)
69	(b)
70	(b)
71	F
72	T
73	T
74	T
75	T
76	F
77	F
78	F
79	F
80	T
81	False
82	False
83	True
84	False
85	True
86	True
87	False
88	True
89	True
90	True

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