



TERM - 1 MATHS
CLASS: XII WORKSHEET: 5
CONTINUITY AND DIFFERENTIABILITY

SL.NO.	QUESTION
1.	The function $y = x - 5 $ is (a) Continuous at $x = 5$ (b) Differentiable at $x = 5$ (c) Both continuous and differentiable at $x = 5$ (d) Neither continuous nor differentiable at $x = 5$
2	At how many points the function $y = \sin x$ is not differentiable? (a) One (b) Two (c) All (d) No
3	$f(x)$ is a polynomial function with degree 7. Which order derivative of the function will be zero? (a) 6 (b) 7 (c) 8 (d) 9
4	The derivative of the function $f(x) = x^x$ w.r.t. 'x' is (a) $1 + \log x$ (b) $x^x(1 + \log x)$ (c) $1+x^x$ (d) None of these
5	The derivative of $\log_{10} x$ w.r.t. 'x' is (a) $\frac{1}{x}$ (b) $\frac{x}{10}$ (c) $\frac{10}{x}$ (d) None of these
6	If $x^y = e^{x-y}$ then $\frac{dy}{dx}$ is (a) $\frac{1+x}{1+\log x}$ (b) $\frac{1-\log x}{1+\log x}$ (c) Not defined (d) $\frac{\log x}{(1+\log x)^2}$
7	If $y = \sin^{-1} \left(\frac{1-x^2}{1+x^2} \right)$, then $\frac{dy}{dx} = \dots$. (a) $\frac{-2}{1+x^2}$ (b) $\frac{2}{1+x^2}$ (c) $\frac{1}{2-x^2}$ (d) $\frac{2}{2-x^2}$
8	For the curve $\sqrt{x} + \sqrt{y} = 1$, $\frac{dy}{dx}$ at $\left(\frac{1}{4}, \frac{1}{4}\right)$ is ... (a) $\frac{1}{2}$ (b) 1 (c) -1 (d) 2
9	Let $f(x) = x + x - 1 $ then (a) $f(x)$ is continuous at $x=0$ as well as at $x=1$ (b) $f(x)$ is continuous at $x=0$ as but not at $x=1$ (c) $f(x)$ is continuous at $x=1$ but not at $x=0$ (d) None of these
10	The value of b for which the function $f(x) = \begin{cases} 5x - 4, & 0 < x \leq 1 \\ 4x^2 + 3bx, & 1 < x < 2 \end{cases}$ is continuous at every point of its domain is... (a) -1 (b) 0 (c) $\frac{13}{3}$ (d) 1

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11	If $y = \sqrt{\sin x + y}$ then $dy/dx = \dots$ (a) $\frac{\cos x}{2y-1}$ (b) $\frac{\cos x}{1-2y}$ (c) $\frac{\sin x}{1-2y}$ (d) $\frac{\sin x}{2y-1}$
12	If $y = \log\left(\frac{1-x^2}{1+x^2}\right)$ then $dy/dx = \dots$ (a) $\frac{4x^3}{1-x^4}$ (b) $\frac{-4x}{1-x^4}$ (c) $\frac{1}{4-x^4}$ (d) $\frac{-4x^3}{1-x^4}$
13	If $y = \sqrt{\tan x}$ then dy/dx at $x = \frac{\pi}{4}$ is given by.. (a) ∞ (b) 1 (c) 0 (d) $1/2$
14	Which of the followings is true about the greatest integer function $f(x) = [x]$? (a) Everywhere continuous on \mathbb{R} (b) Nowhere continuous on \mathbb{R} (c) Continuous on $\mathbb{R} - \mathbb{Z}$ (d) None of these
15	If $y = x x $ then dy/dx for $x < 0$ is (a) $2x$ (b) $-2x$ (c) 0 (d) None of these
16	Let $f(x) = \begin{cases} x + a & \text{if } x \geq 1 \\ ax^2 + 1 & \text{if } x < 1 \end{cases}$ then f is differentiable at $x = 1$ if (a) $a = 1$ (b) $a = 0$ (c) $a = 2$ (d) $a = \frac{1}{2}$
17	The function $f(x) = \sin^{-1}(\cos x)$ is.. (a) discontinuous at $x = 0$ (b) continuous at $x = 0$ (c) Differentiable at $x = 0$ (d) None of these
18	If $x = 2at$ and $y = at^2$, where a is a constant then $\frac{d^2y}{dx^2}$ at $x = \frac{1}{2}$ is (a) $\frac{1}{2a}$ (b) 1 (c) $2a$ (d) None of these
19	If $x = t^2$ and $y = t^3$ then $\frac{d^2y}{dx^2} =$ (a) $3/2$ (b) $3/4t$ (c) $3/2t$ (d) $3t/2$
20	If $y = e^{\tan x}$ then $(\cos^2 x)y_2 = \dots$ (a) $(1 - \sin 2x) y_1$ (b) $-(1 + \sin 2x) y_1$ (c) $(1 + \sin 2x) y_1$ (d) None of these
21	The derivative of $\sin x$ w.r.t. $\cos x$ is (a) 1 (b) -1 (c) 0 (d) None of these
22	$\sin(x+y) = \log(x+y)$ then $\frac{d^2y}{dx^2} = \dots$

	(a) 2 (b) -2 (c) 1 (d) -1
23	Y = a sin mx + b cos mx then $\frac{d^2y}{dx^2} = \dots$ (a) $-m^2y$ (b) m^2y (c) $-my$ (d) my
24	$y = a x^{n+1} + b x^{-n}$ then $x^2 \frac{d^2y}{dx^2} = \dots$ (a) $n(n-1)y$ (b) $n(n+1)y$ (c) ny (d) n^2y
25	The derivative of $\cos^{-1}(2x^2-1)$ with respect to $\cos^{-1}x$ is.... (a) 2 (b) $\frac{1}{2\sqrt{x^2-1}}$ (c) $2/x$ (d) $1-x^2$
26	The derivative of $(\sin x)^{\sin x}$ w.r.t. x is (a) $(\sin x)^{\sin x} (1 + \log(\sin x))$ (b) $(\sin x)^{\sin x} (1 + \log(\sin x)) \cos x$ (c) $(\sin x)^{\sin x} (1 - \log(\sin x)) \cos x$ (d) None of these
27	$\frac{d}{dx} \left\{ \tan^{-1} \left(\frac{\cos x}{1 + \sin x} \right) \right\} = \dots$ (a) $1/2$ (b) $-1/2$ (c) 1 (d) -1
28	Derivative of x^2 w.r.t. x^3 is.... (a) $\frac{3}{2x}$ (b) $\frac{2}{3x}$ (c) $\frac{3x}{2}$ (d) None
29	Derivative of $\sin x^0$ w.r.t. x is.... (a) $\cos x$ (b) $\cos x^0$ (c) $\frac{180}{\pi} \cos x^0$ (d) None of these

CASE STUDY QUESTIONS**Q-1**

CONTINUITY AND DIFFERENTIABILITY

Let $f(x)$ be a real valued function, then its

Left Hand Derivative (L.H.D) at the point a is $f'(a-) = \lim_{x \rightarrow 0} \frac{f(a-h) - f(a)}{-h}$ and

Right Hand Derivative (R.H.D) at the point a is $f'(a+) = \lim_{x \rightarrow 0} \frac{f(a+h) - f(a)}{h}$, also a

function $f(x)$ is said to be differentiable at $x = a$ and if its L.H.D and R.H.D at $x = a$

exist and are equal. For the function $f(x) = \begin{cases} |x - 3| & , x \geq 1 \\ \frac{x^2}{4} - \frac{3x}{2} + \frac{13}{4} & , x < 1 \end{cases}$

Answer the following questions:

1	L.H.D of $f(x)$ at $x = 1$ is	(a) 1	(b) -1
		(c) 0	(d) 2
2	$f(x)$ is non differentiable at	(a) $x = 1$	(b) $x = 2$
		(c) $x = 3$	(d) $x = 4$
3	Find the value of $f'(2)$	(a) 1	(b) 2
		(c) 3	(d) -1
4	Find the value of $f'(-1)$	(a) $x = 1$	(b) $x = 2$
		(c) $x = -2$	(d) $x = -1$
5	R.H.D of $f(x)$ at $x = 1$ is	(a) 1	(b) -1
		(c) 0	(d) 2

Q-2

A function $f(x)$ is said to be continuous in an open interval (a,b) , if it is continuous at every point in the interval.

A function $f(x)$ is said to be continuous in an closed interval $[a,b]$, if $f(x)$ is continuous in (a,b) and

$\lim_{h \rightarrow 0} f(a+h) = f(a)$ and $\lim_{h \rightarrow 0} f(b-h) = f(b)$.

If function $f(x) = \begin{cases} \frac{\sin(a+1)x + \sin x}{x}, & x < 0 \\ c, & x = 0 \\ \frac{\sqrt{x+bx^2} - \sqrt{x}}{bx^{\frac{3}{2}}}, & x > 0 \end{cases}$

Is continuous at $x = 0$, then answer the following questions:

1	The value of a is :	
	(a) -3/2	(b) 1/2
	(c) 0	(d) -1/2
2	The value of b is :	
	(a) 1	(b) -1
	(c) 0	(d) Any real number except 0
3	The value of c is :	
	(a) 1	(b) 1/2
	(c) -1	(d) -1/2
4	The value of c - a is :	
	(a) 1	(b) -1
	(c) 0	(d) 2
5	The value of a + c is :	
	(a) 1	(b) -1
	(c) 0	(d) 2