

**CLASS WORK**

Examine the following functions for continuity at the indicated points

1.  $f(x) = \begin{cases} x^3 + 1, & x \neq 0 \\ 1, & x = 0 \end{cases}$  at  $x = 0$

2.  $f(x) = \begin{cases} \sin x - \cos x, & x \neq 0 \\ -1, & x = 0 \end{cases}$  at  $x = 0$

3.  $f(x) = \begin{cases} \frac{1 - \cos 2x}{x^2}, & x \neq 0 \\ 5, & x = 0 \end{cases}$  at  $x = 0$

4.  $f(x) = \begin{cases} \frac{x^4 + 2x^3 + x^2}{\tan^{-1} x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$  at  $x = 0$

5.  $f(x) = \begin{cases} 3x + 5, & x \geq 2 \\ x^2, & x < 2 \end{cases}$  at  $x = 2$

6.  $f(x) = \begin{cases} \frac{x^2}{2}, & 0 \leq x \leq 1 \\ 2x^2 - 3x + \frac{3}{2}, & 1 < x \leq 2 \end{cases}$  at  $x = 1$

7.  $f(x) = \begin{cases} \frac{\sin x}{x}, & x < 0 \\ x + 1, & x \geq 0 \end{cases}$  at  $x = 0$

8. Find all points of discontinuity of the following functions  
OR  
Discuss the continuity of the following functions

9.  $f(x) = \begin{cases} x^3 - 3, & x \leq 2 \\ x^2 + 1, & x > 2 \end{cases}$

10.  $f(x) = \begin{cases} \frac{\sin x}{x}, & x < 0 \\ x + 1, & x \geq 0 \end{cases}$

11.  $f(x) = \begin{cases} \frac{|x|}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$

12.  $f(x) = \begin{cases} \sin x - \cos x, & x \neq 0 \\ -1, & x = 0 \end{cases}$

13.  $f(x) = \begin{cases} |x| + 3, & x \leq -3 \\ -2x, & -3 < x < 3 \\ 6x + 2, & x \geq 3 \end{cases}$

14.	$f(x) = \begin{cases} 2x, & x < 0 \\ 0, & 0 \leq x \leq 1 \\ 4x, & x > 1 \end{cases}$
	Find the value of k in each of the following: -
15.	$f(x) = \begin{cases} 3x-8, & x \leq 5 \\ 2k, & x > 5 \end{cases}$ is continuous at $x = 5$
16.	$f(x) = \begin{cases} \frac{\sin x}{x} + \cos x, & x \neq 0 \\ k, & x = 0 \end{cases}$ is continuous at $x = 0$
17.	$f(x) = \begin{cases} \frac{1 - \cos 4x}{8x^2}, & x \neq 0 \\ k, & x = 0 \end{cases}$ is continuous at $x = 0$
18.	$f(x) = \begin{cases} \frac{k \cos x}{\pi - 2x}, & x \neq \frac{\pi}{2} \\ 3, & x = \frac{\pi}{2} \end{cases}$ is continuous at $x = \frac{\pi}{2}$
19.	For what value of $\lambda$ in the function $f(x) = \begin{cases} \lambda(x^2 - 2x), & x \leq 0 \\ 4x + 1, & x > 0 \end{cases}$ is continuous at $x = 0$
20.	<p>If the function <math>f(x) = \begin{cases} 3ax + b, &amp; x &gt; 1 \\ 11, &amp; x = 1 \\ 5ax - 2b, &amp; x &lt; 1 \end{cases}</math> is continuous at <math>x = 1</math>.</p> <p>Find the value of a and b.</p>
21.	<p>If the function f defined by <math>f(x) = \begin{cases} \frac{x-5}{ x-5 } + a, &amp; x &lt; 5 \\ a + b, &amp; x = 5 \\ \frac{x-5}{ x-5 } + b, &amp; x &gt; 5 \end{cases}</math> is continuous at <math>x = 5</math>, find the values of a and b.</p>
22.	<p>Find the values of a and b such that the function f defined by <math>f(x) = \begin{cases} 5, &amp; x \leq 2 \\ ax + b, &amp; 2 &lt; x &lt; 10 \\ 21, &amp; x \geq 10 \end{cases}</math> is a continuous function</p>
23.	$f(x) = \begin{cases} x^2 + ax + b, & 0 \leq x < 2 \\ 3x + 2, & 2 \leq x \leq 4 \\ 2ax + 5b, & 4 < x \leq 8 \end{cases}$ is continuous on $[0, 8]$ . Find the values of a and b.

**INDIAN SCHOOL DARSAIT**

**Class XII**

**Mathematics Worksheet**

**Worksheet # 5 Continuity**

**(Chapter – 5: Continuity & Differentiability)**

24.	$\text{If } f(x) = \begin{cases} x + a\sqrt{2} \sin x, & 0 \leq x < \pi/4 \\ 2x \cot x + b, & \pi/4 \leq x < \pi/2 \\ a \cos 2x - b \sin x, & \pi/2 \leq x \leq \pi \end{cases}$ is continuous on $[0, \pi]$ , find the values of a and b.
25.	Find the value of a for which the function $f(x) = \begin{cases} a \sin \frac{\pi}{2}(x+1), & x \leq 0 \\ \frac{\tan x - \sin x}{x^3}, & x > 0 \end{cases}$ is continuous at $x = 0$
26.	If the function f defined by $f(x) = \begin{cases} \frac{\sin(a+1)x + \sin x}{x}, & x < 0 \\ c, & x = 0 \\ \frac{\sqrt{x+bx^2} - \sqrt{x}}{bx^{3/2}}, & x > 0 \end{cases}$ is continuous at $x = 0$ , find the values of a, b and c
27.	If $f(x) = \frac{\sqrt{2} \cos x - 1}{\cot x - 1}$ , $x \neq \frac{\pi}{4}$ , find the value of $f\left(\frac{\pi}{4}\right)$ so that $f(x)$ becomes continuous at $x = \frac{\pi}{4}$ .
28.	Discuss the continuity of the function $f(x) =  x-1  +  x-2 $ at $x=1$ and $x=2$ .
29.	Show that the function $f(x) = \sin(x^2)$ is a continuous function
30.	Show that the function $f(x) =  \cos x $ is a continuous function

**HOME WORK**

Examine the following functions for continuity at the indicated points	
31.	$f(x) = \begin{cases} \frac{1-x^n}{1-x}, & x \neq 1 \\ n-1, & x = 1 \end{cases}$ at $x = 1$
32.	$f(x) = \begin{cases} \frac{2x^2 - 3x - 2}{x-2}, & x \neq 2 \\ 5, & x = 2 \end{cases}$ at $x = 2$
33.	$f(x) = \begin{cases} x \tan^{-1} x, & x \neq 0 \\ 0, & x = 0 \end{cases}$ at $x = 0$
34.	$f(x) = \begin{cases} x \sin^{-1} x, & x \neq 0 \\ 0, & x = 0 \end{cases}$ at $x = 0$
Find all points of discontinuity of the following functions OR Discuss the continuity of the following functions	

35.	$f(x) = \begin{cases} x+5, & x \leq 1 \\ x-5, & x > 1 \end{cases}$
36.	$f(x) = \begin{cases} x+2, & x \leq 1 \\ x-2, & 1 < x < 2 \\ 0, & x \geq 2 \end{cases}$
37.	$f(x) = \begin{cases} x+2, & x < 1 \\ 0, & x = 1 \\ x-2, & x > 1 \end{cases}$
Find the value of k in each of the following: -	
38.	$f(x) = \begin{cases} kx+1, & x \leq 5 \\ 3x-5, & x > 5 \end{cases}$ is continuous at $x = 5$
39.	$f(x) = \begin{cases} 2x+1, & x < 2 \\ k, & x = 2 \\ 3x-1, & x > 2 \end{cases}$ is continuous at $x = 2$
40.	$f(x) = \begin{cases} \frac{\sin x + x \cos x}{x}, & x \neq 0 \\ k, & x = 0 \end{cases}$ is continuous at $x = 0$ .
41.	$f(x) = \begin{cases} \frac{\sin 5x}{3x}, & x \neq 0 \\ k, & x = 0 \end{cases}$ is continuous at $x = 0$ .
42.	Find the choice on a and b so that $f(x) = \begin{cases} ax^2 + b, & x > 2 \\ 2, & x = 2 \\ 2ax - b, & x < 2 \end{cases}$ is continuous at $x = 2$
43.	Find the value of a and b so that the function $f(x) = \begin{cases} x+2, & x \leq 2 \\ ax+b, & 2 < x < 3 \\ 3x-2, & x \geq 3 \end{cases}$ is continuous
44.	If the function f defined by $f(x) = \begin{cases} \frac{x-4}{ x-4 } + p, & x < 4 \\ p+q, & x = 4 \\ \frac{x-4}{ x-4 } + q, & x > 4 \end{cases}$ is continuous at $x = 4$ , find the values of p and q.
45.	$f(x) = \begin{cases} x^2/a, & 0 \leq x < 1 \\ a, & 1 \leq x < \sqrt{2} \\ \frac{2b^2-4b}{x^2}, & \sqrt{2} \leq x < \infty \end{cases}$ is continuous on $[0, \infty)$ . Find the values of a and b.

**INDIAN SCHOOL DARSAIT**

**Class XII**

**Mathematics Worksheet**

**Worksheet # 5 Continuity**

**(Chapter – 5: Continuity & Differentiability)**

46.	If the function f defined by $f(x) = \begin{cases} -2 \sin x, & -\pi \leq x \leq -\pi/2 \\ a \sin x + b, & -\pi/2 < x < \pi/2 \\ \cos x, & \pi/2 \leq x \leq \pi \end{cases}$ is continuous on $[-\pi, \pi]$ . Find the values of a and b
47.	Find the value of the constant k so that the function $f(x) = \begin{cases} \frac{\sqrt{1+kx} - \sqrt{1-kx}}{x}, & -1 \leq x < 0 \\ \frac{2x+1}{x-1}, & 0 \leq x < 1 \end{cases}$ is continuous at $x = 0$
48.	If the function f defined by $f(x) = \begin{cases} \frac{1 - \cos 4x}{x^2}, & x < 0 \\ a, & x = 0 \\ \frac{\sqrt{x}}{\sqrt{16 + \sqrt{x} - 4}}, & x > 0 \end{cases}$ is continuous at $x = 0$ , find the value of a.
49.	Find a relation between a and b so that the function $f(x) = \begin{cases} ax+1, & x \leq 3 \\ bx+3, & x > 3 \end{cases}$ is continuous at $x = 3$ .
50.	Discuss the continuity of the function $f(x) =  x  +  x-1 $ at $x = 1$ .
51.	Show that the function $f(x) = \cos(x^2)$ is a continuous function

**SELF STUDY**

	Examine the following functions for continuity at the indicated points
52.	$f(x) = \begin{cases} 1+x^2, & 0 \leq x < 1 \\ 2-x, & x > 1 \end{cases}$ at $x = 1$
53.	$f(x) = \begin{cases} \frac{ x-a }{x-a}, & x \neq a \\ 1, & x = a \end{cases}$ at the point $x = a$ .
54.	$f(x) = \begin{cases} \frac{3}{2} - x, & \frac{1}{2} < x < 1 \\ \frac{3}{2}, & x = 1 \\ \frac{3}{2} + x, & 1 < x < 2 \end{cases}$ at the point $x = 1$
	Find all points of discontinuity of the following functions OR Discuss the continuity of the following functions

**INDIAN SCHOOL DARSAIT****Class XII****Mathematics Worksheet****Worksheet # 5 Continuity****(Chapter – 5: Continuity & Differentiability)**

55.	$f(x) = \begin{cases} -2, & x \leq -1 \\ 2x, & -1 < x < 1 \\ 2, & x \geq 1 \end{cases}$
	Find the value of k in each of the following: -
56.	$f(x) = \begin{cases} 2x+1, & x < 2 \\ k, & x = 2 \\ 3x-1, & x > 2 \end{cases}$ is continuous at $x = 2$ .
57.	$f(x) = \begin{cases} 3x-8, & x \leq 5 \\ 2k, & x = 5 \end{cases}$ is continuous at $x = 5$ .
58.	$f(x) = \begin{cases} kx+8, & x \leq \pi \\ \cos x, & x > \pi \end{cases}$ is continuous at $x = \pi$ .
59.	$f(x) = \begin{cases} \frac{x^3 + x^2 - 16x + 20}{(x-2)^2}, & x \neq 2 \\ k, & x = 2 \end{cases}$ is continuous at $x = 2$
60.	Show that the function $f(x) = \sin x $ is a continuous function