# INTERNATIONAL INDIAN SCHOOL BURAIDAH

## Worksheet for the Academic Year 2026-27

CLASS: 12 SUBJECT: MATHEMATICS DATE: 26/O5/26

LESSON: CONTINUITY AND DIFFERENTIABILITY

LEVEL – 1

1). If $f(x) = x\tan^{-1}(x), then\ f'(1) is$

a) $\frac{\pi}{4} - \frac{1}{2}$ $b)\ \frac{\pi}{4} + \frac{1}{2}$ $c) - \frac{\pi}{4} - \frac{1}{2}$ $d) - \frac{\pi}{4} + \frac{1}{2}$

2) The value of a for which the function , f(x) = $5x - 4$ , $0 < x \leq 1$

$4x^2 + 3ax$ , $1<x<2$

Is continuous at every point of its domain. Find the value of a .

3) Is the function f(x) = $x$ ; $x \geq 1$

5 ; $x < 1$ , continuous at x = 0, 1, 2 ?.

4) Find the value of k , if f(x) = $2x^2 + k$ ; $x \geq 0$

$-2x^2$ ; $x < 0$ , is continuous at x = 0 .

5) Differentiate w. r. to x

i) $\tan(x^{10})$ $ii)\ \log(7x + 10)$ $iii)\ e^{\cos x}$ $iv)\ 7^{x^5}$ $v)\ \sin(logx)$

6) Differentiate: $e^{-x^2}\log(cosx)\ w.r.to\ x$

7) If y = $\log(\sqrt{x} + \frac{1}{\sqrt{x}}), find\ \frac{dy}{dx}$.

8) Find the second order derivative of $log^{e^{sinx}}$

LEVEL – 2

1) Find whether f(x) = $\frac{2x^2-3x-2}{x-2}$ , $x \neq 2$

5 , x=2 , is continuous or discontinuous at x=2.

2) Show that the function f(x) = $x^3 + 3$ ; $x \neq 0$

$3 - 7x$ ; $x = 0$ , is continuous at x = 0

3) Find the value of a , if f(x) = $\frac{sin^2 ax}{2x^2}$ ; x ≠ 0

1 ; x = 0, is continuous at x = 0 .

4) Differentiate w. r. to $x$

i) $\sqrt{\frac{1-x}{1+x}}$ ii) $sin^3(cosx^7)$ iii) log tan$(\frac{\pi}{4}+\frac{x}{2})$ iv) $cot^{25}(e^{3x})$ v) $\frac{2^x}{x-\log x}$

5) If y = $cosx^{secx}+x^{logx}$ , $find\ \frac{dy}{dx}$.

6) If $x = b^2sin^2\theta$ , $y = a^3cos^2\theta$, $find\ \frac{dy}{dx}$.

7) Differentiate $\tan^{-1}\frac{\sqrt{1+x^2}}{x}\ w.r.to\ x$

8) Differentiate $e^{tanx}\ w.r.to\ .cosx$

9) Find the second order derivative of $e^{8x}$cos(4x)

10) If y = log tan$(\frac{\pi}{4}+\frac{x}{2})$, then prove that $\frac{dy}{dx} - secx = 0$

LEVEL -3

1) Discuss the continuity of the function f(x) = $\frac{1-x^m}{1-x}$ ; $x \neq 1$

$m-1$ ; $x = 1$ , at x = 1

2) Show that the function $f(x) = Ix-2I + Ix-3\ I$ is continuous but not differentiable at x = 2 and x = 3

3) If x = a$(\theta - \sin\theta)\ and\ y = a(1+\cos\theta)$ , find $\frac{d^2y}{dx^2}$.

4) If y = $(\cot^{-1}x)^2$ ,then show that $(x^2+1)^2\ \frac{d^2y}{dx^2} + 2x(x^2+1)\frac{dy}{dx} = 2$

5) If $\log(\frac{x^2-y^2}{x^2+y^2})$ = a, find $\frac{dy}{dx}$

6) If $e^y = e^{x-y}, then\ prove\ that\ \frac{dy}{dx} = \frac{logx}{(logxe)^2}, and\ hence\ ind\ the\ value\ at\ x = e.$

LEVEL – 4

1) Show that the function f(x) = $\frac{1-cos2x}{2x^2}$ ; $x \neq 0$

$1+3x$ ; $x = 0$ , is continuous at x = 0

2) Find the value of a and b , if f(x) = $3ax+b$ ; $x > 1$

11 x = 1

5ax – 2b x < 1 , is continuous at x = 1

3) Differentiate $\tan^{-1}(\frac{\sqrt{1-x^2}}{x})\ w.r.to\ \cos^{-1}(2x\sqrt{1-x^2})$

4) If $e^x + e^y = e^{x+y}$: prove that $\frac{dy}{dx} + e^{y-x} = 0$

5) If $x^m y^n = (x+y)^{m+n}$ : prove that $\frac{dy}{dx} = \frac{y}{x}$.

6) If $y = x^3\log\left(\frac{1}{x}\right)$, then show that $x\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 3x^2 = 0$