

INTERNATIONAL INDIAN SCHOOL BURAI DAH

Worksheet for the Academic Year 2025-26

CLASS:11

SUBJECT: Mathematics

DATE: 29/11/25

LESSON : LIMITS AND DERIVATIVES

1. Evaluate the following limits :

i) $\lim_{x \rightarrow 1} (x + 3)^4$ ii) $\lim_{x \rightarrow 0} (5)$ iii) $\lim_{y \rightarrow \sqrt{2}} \left(\frac{y^2 + 2}{2y} \right)$ iv) $\lim_{x \rightarrow 0} \left(\frac{x^2 - 5x + 6}{x^2 - 4} \right)$

v) $\lim_{x \rightarrow 1} \left(\frac{x^3 - 1}{x - 1} \right)$ vi) $\lim_{x \rightarrow 1/2} \left(\frac{8x^3 - 1}{16x^4 - 1} \right)$ vii) $\lim_{x \rightarrow 1} \left(\frac{2}{1 - x^2} + \frac{1}{x - 1} \right)$ viii) $\lim_{x \rightarrow -5} \left(\frac{2x^2 + 9x - 5}{x + 5} \right)$

ix) $\lim_{x \rightarrow \sqrt{2}} \left(\frac{x^2 - 2}{x^2 + \sqrt{2}x - 4} \right)$ x) $\lim_{x \rightarrow 2} \left(\frac{1}{x - 2} - \frac{2}{x^2 - 2x} \right)$

2. Evaluate the following limits

i) $\lim_{x \rightarrow 2} \left(\frac{x^{10} - 1024}{x - 2} \right)$ ii) $\lim_{x \rightarrow 9} \left(\frac{x^{3/2} - 27}{x - 9} \right)$ iii) $\lim_{x \rightarrow a} \left(\frac{x\sqrt{x} - a\sqrt{a}}{x - a} \right)$ iv) $\lim_{x \rightarrow a} \left(\frac{x^m - a^m}{x^n - a^n} \right)$

v) $\lim_{y \rightarrow 4} \left(\frac{y^3 - 64}{y^2 - 16} \right)$ vi) $\lim_{x \rightarrow 0} \left(\frac{(1+x)^5 - 1}{x} \right)$ vii) $\lim_{a \rightarrow -1/2} \left(\frac{8a^3 + 1}{2a + 1} \right)$ viii) $\lim_{x \rightarrow 2} \left(\frac{x - 2}{\sqrt[3]{x} - \sqrt[3]{2}} \right)$

3. If $\lim_{x \rightarrow 2} \left(\frac{x^n - 2^n}{x - 2} \right) = 80$ and $n \in \mathbb{N}$, find n .

4. If $\lim_{x \rightarrow a} \left(\frac{x^5 - a^5}{x - a} \right) = 405$, find all possible values of a .

5. Find the value of k , if $\lim_{x \rightarrow 1} \left(\frac{x^4 - 1}{x - 1} \right) = \lim_{x \rightarrow k} \left(\frac{x^3 - k^3}{x^2 - k^2} \right)$

6. Evaluate the following

i) $\lim_{x \rightarrow 0} \left(\frac{\sin^2 8x}{x^2} \right)$ ii) $\lim_{x \rightarrow 0} \left(\frac{\sin^2 ax}{\sin^2 bx} \right)$ iii) $\lim_{x \rightarrow 0} \left(\frac{1 - \cos x}{x^2} \right)$ iv) $\lim_{x \rightarrow 0} \left(\frac{\tan x - \sin x}{x^3} \right)$

v) $\lim_{x \rightarrow 0} \left(\frac{\sin 5x + \sin 7x}{5x + \sin 7x} \right)$ vi) $\lim_{x \rightarrow 0} \left(\frac{1 - \cos mx}{1 - \cos nx} \right)$

7. $f(x) = 5x - 4$, $0 < x < 1$

$4x^3 - 3x$, $1 \leq x < 2$. Does $\lim_{x \rightarrow 1} f(x)$ exist

8. If $f(x) = \cos x$, $x > 0$

$x + k$, $x < 0$, find k , if $\lim_{x \rightarrow 0} f(x)$ exist

9. Find the derivatives of the following with respect to x :

i) $\cos^2 x \tan x$ ii) $\frac{\sec x}{\operatorname{cosec} \tan x}$ iii) $\frac{\cos x}{\sec x \tan x}$ iv) $\sqrt{x} - 2x^2 + \operatorname{cosec} x$

$$v) \frac{1}{x-2} - \frac{2}{x^2-2x} \quad vi) \frac{x^3-1}{x+1} \quad vii) \frac{a}{x} + \frac{b}{x^2} - c \quad viii) x^5 \left(\frac{3}{x} + 4x^2 - 10 \right) \quad ix) (x^3 - 2x) \left(\frac{5}{x} - 1 \right)$$

10. Find the derivatives of the following using first principal:

$$i) \frac{1}{x^2} \quad ii) \sin 2x \quad iii) \cos \left(\frac{\pi}{2} - x \right) \quad iv) (x^2 + 15)(x - 5) \quad v) x^{-3}$$