

Lecture - V

Basic Concept of Limit

A limit is the value that a function "approaches" as the input "approaches" some value.

→ Limits are essential to calculus & mathematical analysis & are used to define continuity, derivatives & integrals.

Q # 01

Evaluate

$$\lim_{x \rightarrow 1} \frac{x^2 - 1}{x - 1}$$

$$\therefore x^2 - 1 = (x - 1)(x + 1)$$

Sol

$$\lim_{x \rightarrow 1} \frac{(x - 1)(x + 1)}{(x - 1)}$$

$$\lim_{x \rightarrow 1} (x + 1)$$

$$(1 + 1) = 2$$

✓

Q #02

Evaluate

$$\lim_{x \rightarrow 10} \frac{x}{2} = 5$$

$$\frac{10}{2} = 5$$

5

Ans

Q #03

$$\lim_{x \rightarrow \infty} \frac{1}{x}$$

$$\frac{1}{\infty}$$

= 0

$$\therefore \frac{1}{\infty} = 0$$

Ans

Q #04

Evaluate

$$\lim_{x \rightarrow 1} \frac{x^2 - 1}{x^2 + x - 2}$$

$$\begin{aligned} \therefore x^2 + x - 2 \\ x^2 + 2x - x - 2 \\ x(x+2) - 1(x+2) \\ (x+2)(x-1) \end{aligned}$$

$$\therefore x^2 - 1 = (x-1)(x+1)$$

$$\lim_{x \rightarrow 1} \frac{(x-1)(x+1)}{(x+2)(x-1)}$$

$$\lim_{x \rightarrow 1} \frac{(x+1)}{(x+2)}$$

$$\dagger \frac{(1+1)}{(1+2)}$$

$$\frac{2}{3}$$

Ans

Q # 05

Evaluate

$$\lim_{x \rightarrow 3} \frac{x^2 - 6x + 9}{x^2 - 9}$$

Rough

$$x^2 - 6x + 9$$

$$x^2 - 3x - 3x + 9$$

$$x(x-3) - 3(x-3)$$

$$(x-3)(x-3)$$

$$x^2 - 9$$

$$(x-3)(x+3)$$

put values

$$\lim_{x \rightarrow 3} \frac{(x-3)(x+3)}{(x-3)(x+3)}$$

$$\lim_{x \rightarrow 3} \frac{x-3}{x+3}$$

$$\frac{3-3}{3+3} = \frac{0}{6}$$

$$= 0$$

Q # 06

$$\lim_{x \rightarrow \infty} \frac{1}{x-1}$$

$$\frac{1}{\infty - 1}$$

$$\therefore \frac{1}{\infty} = 0$$

$$\frac{1}{\infty} = 0$$

Ans

Do it Yourself

Practice Question.

Evaluate

$$\lim_{x \rightarrow \infty} \frac{1}{x^2 + 1}$$

END

$$\lim_{t \rightarrow 1} \frac{(t^2 + 2t - 3)}{t^2 - 1}$$