Example 25 $\lim_{x\to 1}[x-1]$, where [.] is greatest integer function, is equal to

(A) 1 (B) 2 (C) 0 (D) does not exists

Solution (D) is the correct answer, since

$$\text{R.H.S} = \lim_{x\to 1^+}[x-1] = 0$$

and

$$\text{L.H.S} = \lim_{x\to 1^-}[x-1] = -1$$

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Evaluate :

1. $\lim_{x \to 3} \frac{x^2 - 9}{x - 3}$

$$\lim_{x \to 3} \frac{x^2-9}{x-3} = \lim_{x \to 3} \frac{(x-3)(x+3)}{(x-3)} = \lim_{x \to 3} (x+3)$$

$$= (3+3) = 6$$ **Ans**

53. Let $f(x) = \begin{cases} x+2 & x \le -1 \\ cx^2 & x > -1 \end{cases}$, find '$c$' if $\lim_{x \to -1} f(x)$ exists.

* As we go from Right hand side

$$R.H.L. = f(-1^+) = c(-1)^2 = c$$

As we go from Left hand side

$$L.H.L = f(-1^-) = (-1) + 2 = 1$$

For Existence of limit R.H.L. = L.H.L.

$$\boxed{c = 1}$$

65. Let $f(x) = \begin{cases} x^2 - 1, 0 < x < 2 \\ 2x + 3, 2 \leq x < 3 \end{cases}$, the quadratic equation whose roots are $\lim\limits_{x \to 2^-} f(x)$ and $\lim\limits_{x \to 2^+} f(x)$ is

(A) $x^2 - 6x + 9 = 0$ (B) $x^2 - 7x + 8 = 0$

(C) $x^2 - 14x + 49 = 0$ (D) $x^2 - 10x + 21 = 0$

$\tan 2x - x$

★ $\lim_{x \to 2^-} f(x) = (2)^2 - 1 = 3$

$\lim_{x \to 2^+} f(x) = 2(2) + 3 = 7$

Quadratic Equation :- $f(x) = (x-3)(x-7)$

$= x^2 - 10x + 21$

80. $\lim_{x \to 3^+} \frac{x}{[x]}$ = ____________________

* $\lim_{x \to 3^+} \frac{x}{[x]} = \frac{3}{3} = 1$ (as $[3^+] = 3$)