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Assignment 1

Set – L

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DEBABRATA BHOWMICK

(1),(a)

$$f(x) = \frac{|x|}{x}, \; x = 0$$

$$\lim_{x \to 0^-} f(x) = \frac{|x|}{x} = -1$$

$$\lim_{x \to 0^+} f(x) = \frac{|x|}{x} = 1$$

So, at the point of 0 f(x) does not exit.

from left side it goes to -1 and from right side it goes to $+1$

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(1), (b)

$$f(x) = \exp\left(\frac{1}{x}\right);\ x = 0$$

L.H.L

$$\lim_{x \to 0^+} f(x) = \lim_{x \to 0^+} \exp\left(\frac{1}{x}\right)$$

$$= \lim_{x \to 0^+} e^{\infty}$$

$$= +\infty$$

R.H.L

$$\lim_{x \to 0^-} f(x) = \lim_{x \to 0^-} \frac{1}{e^x}$$

$$= e^{-\infty}$$

$$= \frac{1}{e^{\infty}}$$

$$= 0$$

$\therefore$ Limit does not exist as ~~L.H.S~~ L.H.L and R.H.L different.

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(1).(c)

$$f(x) = \frac{\sqrt{x^2 - 2x + 1}}{x - 1}$$

$$= \frac{\sqrt{(x-1)^2}}{x - 1}$$

$$= \frac{x - 1}{x - 1}$$

$$= 1$$

when,

$x = 1$,

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

$$\lim_{x \to 1^+} f(x) = 1$$

$\therefore$ At the point of 1 f(x) exists and from both side it goes to 1.

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Assignment 2

(a)

$$f(x) = \begin{cases} 3x-1 & x \leq 1 \\ 3-x & x > 1 \end{cases}$$

$$\lim_{x \to 1^-} f(x)$$

$$\Rightarrow \lim_{x \to 1^-} 3x - 1$$

$$\Rightarrow 3.1 - 1$$

$$= 2 \quad \text{(Ans)}$$

(b)

$$\lim_{x \to 1^+} f(x)$$

$$\Rightarrow \lim_{x \to 1^+} (3x-1)$$

$$= 3 - 1$$

$$= 2 \quad \text{(Ans)}$$

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Assignment 2

(c)

$$\lim_{x \to 1} f(x)$$

$$\Rightarrow \lim_{x \to 1} (3x - 1)$$

$$= 3.1 - 1$$

$$= 2$$

(Ans)

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Assignment 3

(a)

$$\lim_{x \to +\alpha} \frac{3x+5}{6x-8}$$

$$= \lim_{x \to \alpha} \frac{3+\frac{5}{x}}{6+\frac{8}{x}}$$

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

$$= \frac{1}{2}$$

(Ans)

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Assignment 3

(b)

$$\lim_{x \to -\infty} \frac{4x^2 - x}{2x^3 - 5}$$

$$= \lim_{x \to \infty} \frac{\frac{4}{x} - \frac{1}{x^2}}{2 - \frac{5}{x^3}}$$

$$= \frac{0}{2}$$

$$0$$

(Ans)

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Assignment 4

$$\lim_{x\to 3} \frac{x^3 - 13x^2 + 51x - 63}{x^3 - 4x^2 - 3x + 18} = \frac{a}{5}$$

$$\Rightarrow \lim_{x\to 3} \frac{3x^2 - 26x + 51}{3x^2 - 8x - 3} = \frac{a}{5}$$

$$= \lim_{x\to 3} \frac{6x - 26}{6x - 8} = \frac{a}{5}$$

$$\Rightarrow \frac{6\cdot 3 - 26}{6\cdot 3 - 8} = \frac{a}{5}$$

$$\therefore a = -4$$

(Ans)

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Assignment (5)

$$\lim_{x \to 2} \frac{3x^2 + ax + a + 3}{x^2 + x - 2}$$

if $x \to -2$ then function does not exist.

so, numeratore $3x^2 + ax + a + 3 = 0$

or, $3(-2)^2 + (-2)a + a + 3 = 0$

or, $12 - 2a + a + 3 = 0$

or, $-a + 15 = 0$

or, $a = 15$

so, $a = 15$

$$\lim_{x \to -2} \frac{3x^2 + 15x + 15 + 3}{x^2 + x - 2}$$

$$= \lim_{x \to -2} \frac{3x^2 + 15x + 18}{(x+2)(x-1)}$$

$$= \lim_{x \to -2} \frac{3(x+3)(x+2)}{(x+2)(x-1)}$$

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$$= \lim_{x \to -2} \frac{3(x+3)}{(x-1)}$$

$$= \frac{3(-2+3)}{-2-1}$$

$$= \frac{3 \cdot 1}{-3}$$

$$= -1 \quad \text{(Ans)}$$