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17/ENG103/052

Civil Engineering

ENG 281

1. $f(x) = \pi$

$$\lim_{x \rightarrow 3} f(x) = ?$$

~~The~~ The limit does not exist.

2. $f(x) = 5x - 21$

Soln

$$\lim_{x \rightarrow 6} f(x) = 5x - 21$$

L.H.L

R.H.L

$$\lim_{x \rightarrow 6^-} f(x)$$

$$\lim_{x \rightarrow 6^+} f(x)$$

L.H.L		R.H.L		
$a - \delta$	lim	$a + \delta$	lim	
5.9	8.5	6.1	9.5	
5.91	8.55	6.09	9.45	
5.92	8.6	6.08	9.4	
5.93	8.65	6.07	9.35	
5.94	8.7	6.06	9.3	
5.95	8.75	6.05	9.25	
5.96	8.8	6.04	9.2	
5.97	8.85	6.03	9.15	
5.98	8.9	6.02	9.1	
5.99	8.95	6.01	9.05	
6	9	6	9	By observation L.H.L = R.H.L

$\therefore [f(x) = 5x - 21]$ tends to 9 as $x \rightarrow 6$

$$3. \lim_{x \rightarrow 3^+} \frac{3-x}{|3-x|}$$

Soln

$$\begin{aligned} \therefore \lim_{x \rightarrow 3^+} \frac{3-x}{|3-x|} &= \frac{3-(3+h)}{3-(3+h)} = \frac{3-3+h}{3-3+h} \\ &= \frac{0-h}{0-h} = \frac{h}{h} \rightarrow \text{where } h=0 \\ &= \frac{0}{0} \end{aligned}$$

\therefore the limit is undefined at the right hand limit ($R.H.L$).

$$4. \lim_{x \rightarrow 3} \frac{x-3}{|x-3|}$$

Soln

at $x < 0$

$$\lim_{x \rightarrow 3} \left[\frac{(3-h)-3}{(3-h)-3} \right] = \frac{0}{0} = \text{undefined (Indeterminate form)}$$

at $x > 0$

$$\lim_{x \rightarrow 3} \left[\frac{(3+h)-3}{(3+h)-3} \right] \text{ where } h \rightarrow 0 = \frac{3-3}{3-3} = \frac{0}{0} = \text{undefined (Indeterminate form)}$$

\therefore The limits do not exist from both left hand limit and right hand limit

5. Show that $f(x) = \sqrt{x-4}$ is continuous at interval $(4, 8)$

Soln

$$\text{At } f(x) = \sqrt{x-4}$$

$$x \rightarrow 4 = \sqrt{4-4} = \sqrt{0} = 0$$

$$\therefore f(x) = \sqrt{x-4}$$

$$x \rightarrow 8 = \sqrt{8-4} = \sqrt{4} = 2$$

4, 5, 6, 7, 8

0, 1, 1.4, 1.7, 2

Note: We substitute values for x to get the y values.

$\therefore f(x)$ is continuous at (4, 8)

Continuity graph

