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COURSE CODE: ENG 281
DEPARTMENT: MECHATRONIC ENGINEERING
MAT NO: 17/ENG05/041

1) $\lim_{x \rightarrow 3} f(x)$

$f(x) = \pi$

Solution

$\therefore \lim_{x \rightarrow 3} \pi = \pi$

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

Solution

$f(x) = 5x - 21$

$\delta = 0.1$

$a = 6$

$x = a + \delta$

δ	$f(x)$	$a - \delta$	$a + \delta$	$f(x)$
0.1	$5(5.90) - 21 = 8.50$	5.90	6.10	$5(6.10) - 21 = 9.50$
0.01	$5(5.91) - 21 = 8.55$	5.91	6.09	$5(6.09) - 21 = 9.45$
0.02	$5(5.92) - 21 = 8.6$	5.92	6.08	$5(6.08) - 21 = 9.40$
0.03	$5(5.93) - 21 = 8.65$	5.93	6.07	$5(6.07) - 21 = 9.35$
0.04	$5(5.94) - 21 = 8.70$	5.94	6.06	$5(6.06) - 21 = 9.30$
0.05	$5(5.95) - 21 = 8.75$	5.95	6.05	$5(6.05) - 21 = 9.25$
0.06	$5(5.96) - 21 = 8.80$	5.96	6.04	$5(6.04) - 21 = 9.20$
0.07	$5(5.97) - 21 = 8.85$	5.97	6.03	$5(6.03) - 21 = 9.15$
0.08	$5(5.98) - 21 = 8.90$	5.98	6.02	$5(6.02) - 21 = 9.10$
0.09	$5(5.99) - 21 = 8.95$	5.99	6.01	$5(6.01) - 21 = 9.05$
0.10	$5(6.00) - 21 = 9.00$	6.00	6.00	$5(6.00) - 21 = 9.00$

$\lim_{x \rightarrow 6} f(x) = 9$ The limit exists for both positive and negative sides.

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

let $x = a + \delta$, where $a = 3$.

$$\begin{aligned} \lim_{x \rightarrow 3^+} &= \frac{3 - (a + \delta)}{|3 - (a + \delta)|} = \frac{3 - (3 + \delta)}{3 - (3 + \delta)} = \frac{-\delta}{|-\delta|} \\ &= \frac{-\delta}{\delta} = \underline{\underline{-1}} \end{aligned}$$

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

Solution

at $x < 0$

$$\lim_{h \rightarrow 0} \frac{(3-h) - 3}{|(3-h) - 3|} = \frac{0}{0} \quad \therefore \text{Indeterminate form.}$$

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

Solution

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

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

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

$$\text{at } x \rightarrow 8 = \sqrt{8-4}$$

$$= \sqrt{4} = 2.$$

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