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Matric no: 17/ENG06/087
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Assignment

⇒ (1) Given a function to be as in Equation (1)

$f(x) = \pi$, find $\lim_{x \to 3} f(x)$

Sol

$f(x) = \pi = \pi(x^0)$

$\lim_{x \to 3} = \pi(3^0) = \pi = 3.142$

⇒ (2) The model of a system has been developed by an Engineer to be as given in equation (2) $f(x) = 5x - 21$

Given that $\delta = 0.1$ and using a step of 0.01, demonstrate, in tabular form that the limit of the model as $x \to 6$ is equal to 9.

Sol

using the equation $5x - 21$

$\therefore$ as $x \to 6$, $5x - 21 = 5(6) - 21 = 30 - 21 = 9$

x	$f(x) = 5x - 21$	y
5.91	$5(5.91) - 21 = 8.55$	8.55
5.92	$5(5.92) - 21 = 8.6$	8.6
5.93	$5(5.93) - 21 = 8.65$	8.65
5.94	$5(5.94) - 21 = 8.7$	8.7
5.95	$5(5.95) - 21 = 8.75$	8.75
5.96	$5(5.96) - 21 = 8.8$	8.8
5.97	$5(5.97) - 21 = 8.85$	8.85
5.98	$5(5.98) - 21 = 8.9$	8.9
5.99	$5(5.99) - 21 = 8.95$	8.95
6	$5(6) - 21 = 9$	9

$\therefore f(x)$ of $5x - 21$ as $x \to 6$ is equal to 9

⇒ (3) Find the limit of the model equation given in equation 3

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

sol

$$\lim_{x \to 3^+} \frac{3 - x}{|3 - x|} = \lim_{x \to h} \frac{(x+h) - 3}{|(x+h) - 3|} = \cancel{3 + h - 3}$$

$$\lim_{h \to 0} \frac{3 - (x+h)}{|3 - (x+h)|} = \frac{3 - (3+h)}{|3 - (3+h)|} = \frac{-h}{h} = -1$$

(4) Evaluate the limit of the model given in equation 4, if it exists.

$$\lim_{x \to 3} \frac{x - 3}{|x - 3|}$$

sol

$$\lim_{x \to 3} \frac{x - 3}{|x - 3|} = \frac{3 - 3}{|3 - 3|} = \frac{0}{|0|} = \text{undefined.}$$

$$\therefore \lim_{x \to 3^+} \frac{x - 3}{|x - 3|} = \lim_{h \to 0} \frac{(3+h) - 3}{|(3+h) - 3|} = \frac{h}{|h|} = 1$$

$$\lim_{x \to 3^-} \frac{x - 3}{|x - 3|} = \lim_{h \to 0} \frac{(3-h) - 3}{|(3-h) - 3|} = \frac{-h}{|-h|} = \frac{-h}{h} = -1$$

$$\therefore \lim_{x \to 3^+} \frac{x - 3}{|x - 3|} \neq \lim_{x \to 3^-} \frac{x - 3}{|x - 3|}$$

(5). Show that the function given in equation 5

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

sol

given the function $f(x) = \sqrt{x - 4}$

$\therefore$ as $x \to 4$, $f(x) = \sqrt{4 - 4} = \sqrt{0} = 0$ — 1

and $x \to 8$, $f(x) = \sqrt{8 - 4} = \sqrt{4} = 2$ — 2

$\therefore$ from eqs (1) and (2), the value of $\sqrt{x - 4}$ is continuous at $x = 8$

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