

1. Given a function to be as $f(x) = \pi$.

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

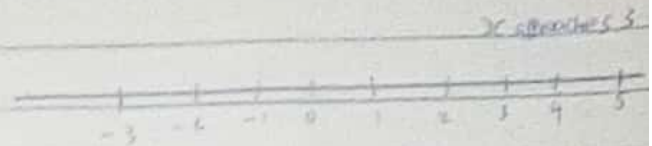
Solution

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

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

Since $\pi = 3.143$

$\therefore \lim_{x \rightarrow 3} f(x) = 3.143$



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

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

Answer

$x = 6, \delta = 0.1$, using step of 0.01

| Condition | x | f(x) |
|----------------|------------|-----------------------|
| Step of 0.01 | $6 + 0.01$ | $5(6.01) - 21 = 9.05$ |
| $\delta = 0.1$ | $6 + 0.1$ | $5(6.1) - 21 = 9.5$ |
| $x = 6$ | 6 | $5(6) - 21 = 9$ |

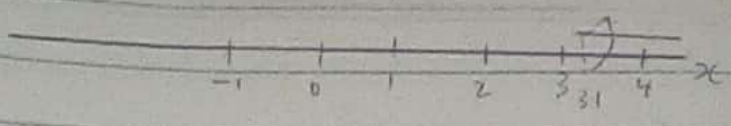
$\therefore \lim_{x \rightarrow 6} 5x - 21 = 9$

3. Find the limit of the model given as

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

Solution

Using $x = 3$ $\lim_{x \rightarrow 3^+} \frac{3-3}{|3-3|} = \frac{0}{0} = \text{Undefined}$



Using $x = 3.1$

$$\lim_{x \rightarrow 3^+} \frac{3-3.1}{|3-3.1|} = \frac{-0.1}{|-0.1|} = \frac{-0.1}{0.1} = -1$$

$$\therefore \lim_{x \rightarrow 3^+} \frac{3-3.01}{|3-3.01|} = \frac{-0.01}{|-0.01|} = \frac{-0.01}{0.01} = -1$$

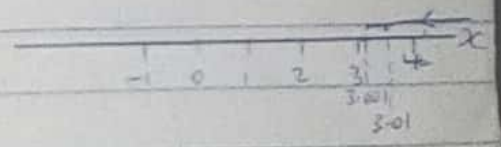
$$\therefore \lim_{x \rightarrow 3^+} \frac{3-x}{|3-x|} = -1$$

4. Evaluate the limit of the model given as $\lim_{x \rightarrow 3} \frac{x-3}{|x-3|}$. If it exists

Solution

$$\lim_{x \rightarrow 3^+} \frac{3-3}{|3-3|} = \frac{0}{0} = \text{Undefined}$$

$$\text{Using } x = 2.9 = \frac{2.9-3}{|2.9-3|} = -1$$



$$\text{Using } x = 2.99 = \frac{2.99-3}{|2.99-3|} = -1$$

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

$$\therefore \lim_{x \rightarrow 3} \frac{x-3}{|x-3|} = \text{Does not exist}$$

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

Solution

| | Interval | $f(x)$ |
|-------|----------|--------|
| Using | 4 | 0 |
| | 5 | 1 |
| | 6 | 1.4 |
| | 7 | 1.7 |
| | 8 | 2 |

