



Continuity Ex 9.1 Q1

We have to check the continuity of function at $x = 0$.

$$\text{L.H.L} = \lim_{x \rightarrow 0^-} f(x) = \lim_{h \rightarrow 0} f(0-h) = \lim_{h \rightarrow 0} \frac{-h}{|-h|} = \lim_{h \rightarrow 0} \frac{-h}{h} = -1$$

$$\text{R.H.L} = \lim_{x \rightarrow 0^+} f(x) = \lim_{h \rightarrow 0} f(0+h) = \lim_{h \rightarrow 0} \frac{h}{|h|} = 1$$

Thus, $\text{LHL} \neq \text{RHL}$

So, the given function is discontinuous and the discontinuity is of first kind.

Continuity Ex 9.1 Q2

We have, to check the continuity at $x = 3$.

$$\text{L.H.L} = \lim_{x \rightarrow 3^-} f(x) = \lim_{h \rightarrow 0} f(3-h) = \lim_{h \rightarrow 0} \frac{(3-h)^2 - (3-h) - 6}{(3-h) - 3} = \lim_{h \rightarrow 0} \frac{h^2 - 5h}{-h} = \lim_{h \rightarrow 0} -h + 5 = 5$$

$$\text{R.H.L} = \lim_{x \rightarrow 3^+} f(x) = \lim_{h \rightarrow 0} f(3+h) = \lim_{h \rightarrow 0} \frac{(3+h)^2 - (3+h) - 6}{(3+h) - 3} = \lim_{h \rightarrow 0} \frac{h^2 + 5h}{h} = \lim_{h \rightarrow 0} h + 5 = 5$$

$$f(3) = 5$$

Thus, we have, $\text{LHL} = \text{RHL} = f(3) = 5$

So, The function is continuous at $x = 3$

Continuity Ex 9.1 Q3

We have, to check the continuity of the function at $x = 3$.

$$\text{LHL} = \lim_{x \rightarrow 3^-} f(x) = \lim_{h \rightarrow 0} f(3-h) = \lim_{h \rightarrow 0} \frac{(3-h)^2 - 9}{(3-h) - 3} = \lim_{h \rightarrow 0} \frac{h^2 - 6h}{-h} = \lim_{h \rightarrow 0} -h + 6 = 6$$

$$\text{RHL} = \lim_{x \rightarrow 3^+} f(x) = \lim_{h \rightarrow 0} f(3+h) = \lim_{h \rightarrow 0} \frac{(3+h)^2 - 9}{(3+h) - 3} = \lim_{h \rightarrow 0} \frac{h^2 + 6h}{h} = \lim_{h \rightarrow 0} h + 6 = 6$$

$$f(3) = 6$$

Thus, we have, $\text{LHL} = \text{RHL} = f(3) = 6$

So, the given function is continuous at $x = 3$.

Continuity Ex 9.1 Q4

We want, to check the continuity of the function at $x = 1$.

$$\text{LHL} = \lim_{x \rightarrow 1^-} f(x) = \lim_{h \rightarrow 0} f(1-h) = \lim_{h \rightarrow 0} \frac{(1-h)^2 - 1}{(1-h) - 1} = \lim_{h \rightarrow 0} \frac{h^2 - 2h}{-h} = \lim_{h \rightarrow 0} -h + 2 = 2$$

$$\text{RHL} = \lim_{x \rightarrow 1^+} f(x) = \lim_{h \rightarrow 0} f(1+h) = \lim_{h \rightarrow 0} \frac{(1+h)^2 - 1}{(1+h) - 1} = \lim_{h \rightarrow 0} \frac{h^2 + 2h}{h} = \lim_{h \rightarrow 0} h + 2 = 2$$

$$f(1) = 2$$

we find that $\text{LHL} = \text{RHL} = f(1) = 2$

Hence, $f(x)$ is continuous at $x = 1$.

***** END *****

