Continuity Ex 9.1 Q11

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

$$\text{LHL} = \lim_{x\to1^-} f(x) = \lim_{h\to0} f(1-h) = \lim_{h\to0} 1+(1-h)^2 = \lim_{h\to0} 1+1-2h+h^2 = 2$$

$$\text{RHL} = \lim_{x\to1^+} f(x) = \lim_{h\to0} f(1+h) = \lim_{h\to0} 2-(1+h) = 1$$

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

Hence, the function is discontinuous at $x = 1$

This is discontinuity of I^{st} kind.

Continuity Ex 9.1 Q12

We want to check the continuity at $x = 0$.

$$\text{LHL} = \lim_{x\to0^-} f(x) = \lim_{h\to0} f(0-h) = \lim_{h\to0} \frac{\sin(3\times(-h))}{\tan(2\times(-h))} = \lim_{h\to0} \frac{-\sin 3h}{-\tan 2h} = \lim_{h\to0} \frac{\frac{\sin 3h}{3h}\times 3h}{\frac{\tan 2h}{2h}\times 2h} = \frac{3}{2}$$

$$\text{RHL} = \lim_{x\to0^+} f(x) = \lim_{h\to0} f(0+h) = \lim_{h\to0} \frac{\log(1+3h)}{e^{2h}-1} = \lim_{h\to0} \frac{\frac{\log(1+3h)}{3h}\times 3h}{\frac{e^{2h}-1}{2h}\times 2h} = \frac{3}{2}$$

$f(0) = \frac{3}{2}$

Thus, $\text{LHL} = \text{RHL} = f(0) = \frac{3}{2}$

Hence, the function is continuous at $x = 0$

Continuity Ex 9.1 Q13

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

$$\text{LHL} = \lim_{x\to0^-} f(x) = \lim_{h\to0} f(0-h) = \lim_{h\to0} 2(-h)-|-h| = \lim_{h\to0} -2h-h = 0$$

$$\text{RHL} = \lim_{x\to0^+} f(x) = \lim_{h\to0} f(0+h) = \lim_{h\to0} 2h-|h| = 0$$

$f(0) = 0$

Thus, $\text{LHL} = \text{RHL} = f(0) = 0$

Hence, the function is continuous at $x = 0$

Continuity Ex 9.1 Q14

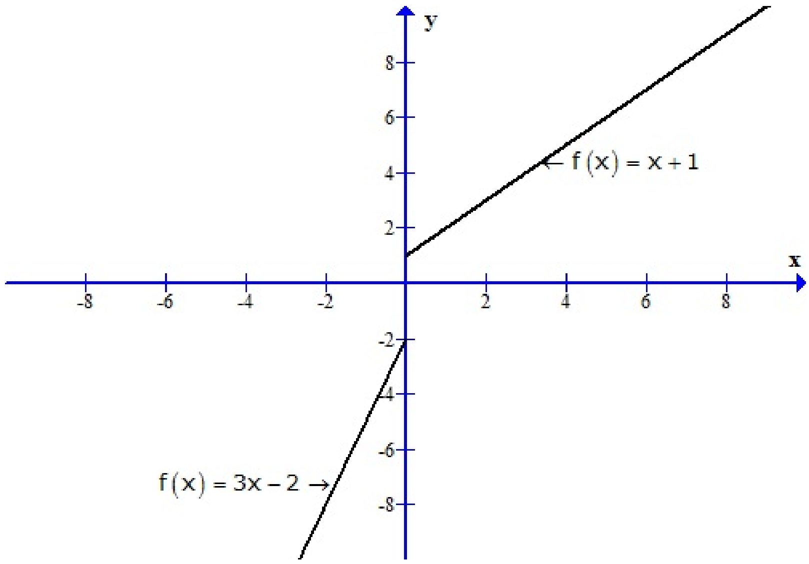
We want to check the continuity of the function at $x = 0$.

$$\text{LHL} = \lim_{x\to0^-} f(x) = \lim_{h\to0} f(0-h) = \lim_{h\to0} 3(-h)-2 = \lim_{h\to0} -3h-2 = -2$$

$$\text{RHL} = \lim_{x\to0^+} f(x) = \lim_{h\to0} f(0+h) = \lim_{h\to0} h+1 = 1 = 0$$

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

So, the function is discontinuous



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