



Continuity Ex 9.1 Q31

We are given that the function is continuous at $x = 2$

$$\therefore \text{LHL} = \text{RHL} = f(2) \quad \dots (1)$$

Now,

$$f(2) = k \quad \dots (A)$$

$$\begin{aligned} \text{LHL} &= \lim_{x \rightarrow 2^-} f(x) = \lim_{h \rightarrow 0} f(2-h) = \lim_{h \rightarrow 0} \frac{2^{(2-h)+2} - 16}{4^{(2-h)} - 16} = \lim_{h \rightarrow 0} \frac{2^{4-h} - 16}{4^{2-h} - 16} \\ &= \lim_{h \rightarrow 0} \frac{2^4 \cdot 2^{-h} - 16}{4^2 \cdot 4^{-h} - 16} \\ &= \lim_{h \rightarrow 0} \frac{16 \cdot 2^{-h} - 16}{16 \cdot 4^{-h} - 16} \\ &= \lim_{h \rightarrow 0} \frac{16(2^{-h} - 1)}{16(4^{-h} - 1)} \\ &= \lim_{h \rightarrow 0} \frac{2^{-h} - 1}{(2^{-h})^2 - 1^2} \quad \left[\because 2^{-2h} = (2^{-h})^2 = 4^{-h} \right] \\ &= \lim_{h \rightarrow 0} \frac{2^{-h} - 1}{(2^{-h} - 1)(2^{-h} + 1)} = \frac{1}{2} \quad \dots (B) \end{aligned}$$

\therefore Using (1) from (A) & (B)

$$k = \frac{1}{2}$$

Continuity Ex 9.1 Q33

We know that a function is said to be continuous at $x = \pi$ if

$$\text{LHL} = \text{RHL} = \text{value of the function at } x = \pi \dots (1)$$

$$\begin{aligned} \text{LHL} &= \lim_{x \rightarrow \pi^-} f(x) = \lim_{h \rightarrow 0} f(\pi - h) = \lim_{h \rightarrow 0} \frac{1 - \cos 7(\pi - h - \pi)}{5((\pi - h) - \pi)^2} = \lim_{h \rightarrow 0} \frac{1 - \cos 7h}{5h^2} \\ &= \lim_{h \rightarrow 0} \frac{2 \sin^2 \frac{7}{2} h}{5h^2} \\ &= \lim_{h \rightarrow 0} \frac{2}{5} \left(\frac{\sin \frac{7}{2} h}{\frac{7}{2} h} \right)^2 \times \left(\frac{7}{2} \right)^2 \\ &= \frac{2}{5} \times \frac{49}{4} = \frac{49}{10} \dots (B) \end{aligned}$$

Thus, using (1) we get,

$$f(\pi) = \frac{49}{10}$$

Continuity Ex 9.1 Q34

It is given that the function is continuous at $x = 0$

$$\therefore \text{LHL} = \text{RHL} = f(0) \dots (1)$$

$$\begin{aligned} \text{LHL} &= \lim_{x \rightarrow 0^-} f(x) = \lim_{h \rightarrow 0} f(0-h) = \lim_{h \rightarrow 0} \frac{2(-h) + 3 \sin(-h)}{3(-h) + 2 \sin(-h)} = \lim_{h \rightarrow 0} \frac{-2h - 3 \sin h}{-3h - 2 \sin h} \\ &= \lim_{h \rightarrow 0} \frac{2h + 3 \sin h}{3h + 2 \sin h} \\ &= \lim_{h \rightarrow 0} \frac{2 + 3 \frac{\sin h}{h}}{3 + 2 \frac{\sin h}{h}} = \frac{2+3}{3+2} = 1 \quad \left[\because \lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1 \right] \end{aligned}$$

Using (1) we get,

$$f(0) = 1$$

Continuity Ex 9.1 Q35

It is given that the function is continuous at $x = 0$.

$$\text{LHL} = \text{RHL} = f(0) \dots (1)$$

$$f(0) = k \dots (A)$$

$$\text{LHL} = \lim_{x \rightarrow 0^-} f(x) = \lim_{h \rightarrow 0} f(0-h) = \lim_{h \rightarrow 0} \frac{1 - \cos 4(-h)}{8(-h)^2} = \lim_{h \rightarrow 0} \frac{1 - \cos 4h}{8h^2} = \lim_{h \rightarrow 0} \frac{2\sin^2 2h}{8h^2} = \lim_{h \rightarrow 0} \left(\frac{\sin 2h}{2h}\right)^2 = 1$$

Thus, using (1) we get,

$$k = 1$$

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