

Question 10

Evaluate the limit:

$$\lim_{x \rightarrow 0} \frac{\sin(3x)}{x}$$

Question 10 - Solution

We are given:

$$\lim_{x \rightarrow 0} \frac{\sin(3x)}{x}$$

We want to simplify the expression to match a known limit. Recall the standard limit:

$$\lim_{u \rightarrow 0} \frac{\sin(u)}{u} = 1$$

Let $u = 3x$. As $x \rightarrow 0$, we also have $u \rightarrow 0$.

So:

$$\frac{\sin(3x)}{x} = \frac{\sin(3x)}{3x} \cdot 3$$

Now apply the limit:

$$\lim_{x \rightarrow 0} \frac{\sin(3x)}{x} = \lim_{x \rightarrow 0} \left(\frac{\sin(3x)}{3x} \cdot 3 \right) = \left(\lim_{u \rightarrow 0} \frac{\sin(u)}{u} \right) \cdot 3 = 1 \cdot 3 = \boxed{3}$$