

Exercise 44

Find the limit.

$$\lim_{x \rightarrow 0} \frac{\sin 3x \sin 5x}{x^2}$$

Solution

Rewrite the limit in terms of one that is known.

$$\begin{aligned} \lim_{x \rightarrow 0} \frac{\sin 3x \sin 5x}{x^2} &= 15 \lim_{x \rightarrow 0} \left(\frac{\sin 3x}{3x} \cdot \frac{\sin 5x}{5x} \right) = 15 \left(\lim_{x \rightarrow 0} \frac{\sin 3x}{3x} \right) \left(\lim_{x \rightarrow 0} \frac{\sin 5x}{5x} \right) \\ &= 15 \left(\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} \right) \left(\lim_{\alpha \rightarrow 0} \frac{\sin \alpha}{\alpha} \right) \\ &= 15(1)(1) \\ &= 15 \end{aligned}$$