

Dr Oliver Mathematics
Principles of Differentiation: Part 1

1. What is

$$\lim_{h \rightarrow 0} \frac{8(\frac{1}{2} + h)^8 - 8(\frac{1}{2})^8}{h}?$$

Solution

Remember : $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$.

This is the derivative of

$$f(x) = 8x^8 \text{ at } x = \frac{1}{2}.$$

Now,

$$f(x) = 8x^8 \Rightarrow f'(x) = 64x^7$$

and so

$$\begin{aligned} f'(\frac{1}{2}) &= 64 \cdot (\frac{1}{2})^7 \\ &= 64 \cdot (\frac{1}{128}) \\ &= \underline{\underline{\frac{1}{2}}}. \end{aligned}$$