

Exercise 28

Evaluate the difference quotient for the given function. Simplify your answer.

$$f(x) = x^3, \quad \frac{f(a+h) - f(a)}{h}$$

Solution

$$\begin{aligned} \frac{f(a+h) - f(a)}{h} &= \frac{(a+h)^3 - (a)^3}{h} \\ &= \frac{(a^3 + 3a^2h + 3ah^2 + h^3) - a^3}{h} \\ &= \frac{3a^2h + 3ah^2 + h^3}{h} \\ &= 3a^2 + 3ah + h^2 \end{aligned}$$