

Exercise 43

Find the derivative of the function.

$$g(x) = (2ra^{rx} + n)^p$$

Solution

Take the derivative using the chain rule.

$$\begin{aligned}g'(x) &= \frac{dg}{dx} = \frac{d}{dx}(2ra^{rx} + n)^p \\&= p(2ra^{rx} + n)^{p-1} \cdot \frac{d}{dx}(2ra^{rx} + n) \\&= p(2ra^{rx} + n)^{p-1} \cdot 2r \frac{d}{dx}(a^{rx}) \\&= p(2ra^{rx} + n)^{p-1} \cdot 2r \frac{d}{dx}(e^{\ln a^{rx}}) \\&= p(2ra^{rx} + n)^{p-1} \cdot 2r \frac{d}{dx}(e^{rx \ln a}) \\&= p(2ra^{rx} + n)^{p-1} \cdot 2r(e^{rx \ln a}) \cdot \frac{d}{dx}(rx \ln a) \\&= p(2ra^{rx} + n)^{p-1} \cdot 2r(e^{rx \ln a}) \cdot (r \ln a) \\&= 2pr^2(\ln a)(2ra^{rx} + n)^{p-1}e^{rx \ln a}\end{aligned}$$