

Exercise 13

Find the derivative of the function.

$$y = x^2 e^{-3x}$$

Solution

Take the derivative using the product rule and the chain rule.

$$\begin{aligned} y' &= \frac{dy}{dx} = \frac{d}{dx}(x^2 e^{-3x}) \\ &= \left[\frac{d}{dx}(x^2) \right] e^{-3x} + x^2 \left[\frac{d}{dx}(e^{-3x}) \right] \\ &= (2x)e^{-3x} + x^2 \left[e^{-3x} \cdot \frac{d}{dx}(-3x) \right] \\ &= 2xe^{-3x} + x^2 [e^{-3x}(-3)] \\ &= 2xe^{-3x} - 3x^2 e^{-3x} \\ &= x(2 - 3x)e^{-3x} \end{aligned}$$