

**Exercise 36**

Find the derivative of the function.

$$y = x^2 e^{-1/x}$$

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**Solution**

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

$$\begin{aligned} y' &= \frac{dy}{dx} = \frac{d}{dx} (x^2 e^{-1/x}) \\ &= \left[ \frac{d}{dx} (x^2) \right] e^{-1/x} + x^2 \left[ \frac{d}{dx} (e^{-1/x}) \right] \\ &= (2x) e^{-1/x} + x^2 \left[ e^{-1/x} \cdot \frac{d}{dx} \left( -\frac{1}{x} \right) \right] \\ &= (2x) e^{-1/x} + x^2 \left[ e^{-1/x} \cdot \left( \frac{1}{x^2} \right) \right] \\ &= (2x + 1) e^{-1/x} \end{aligned}$$