

Solutions

Each answer shows the steps, then the **result**.

2.1

- $\frac{dy}{dx} = 2xe^x + x^2e^x = xe^x(2 + x)$

2.2

- $\frac{dy}{dx} = \frac{x \cos x - \sin x}{x^2}$

3.1 C

- $\ln(3x) = \ln 3 + \ln x$, so the derivative is $\frac{1}{x}$

3.2

- $\frac{dx}{dt} = 2t$, $\frac{dy}{dt} = 3t^2 - 3$; $\frac{dy}{dx} = \frac{3t^2 - 3}{2t}$; stationary where $3t^2 - 3 = 0 \Rightarrow t = \pm 1$

3.3

(a)

- differentiate: $2x + y + x\frac{dy}{dx} + 2y\frac{dy}{dx} = 0$; $\frac{dy}{dx} = -\frac{2x + y}{x + 2y}$

(b)

- at $(1, 2)$: $\frac{dy}{dx} = -\frac{2 + 2}{1 + 4} = -\frac{4}{5}$