

KEY

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1. Find the derivative of  $f(x) = \frac{x^2-1}{x}$ .

Using quotient rule we obtain:

$$\begin{aligned} f'(x) &= \frac{\frac{d}{dx}(x^2-1) \cdot x - \frac{d}{dx}(x) \cdot (x^2-1)}{x^2} \\ &= \frac{(2x) \cdot x - 1 \cdot (x^2-1)}{x^2} \\ &= \frac{2x^2 - x^2 + 1}{x^2} = \frac{x^2 + 1}{x^2} \end{aligned}$$

2. Find the derivative of  $g(x) = x \sin(x^2)$ .

Using chain and product rules we obtain:

$$\begin{aligned} g'(x) &= \frac{d}{dx}(x) \cdot \sin(x^2) + x \cdot \frac{d}{dx}(\sin(x^2)) \\ &= \sin(x^2) + x \cdot \left[ \cos(x^2) \cdot \frac{d}{dx}(x^2) \right] \\ &= \sin(x^2) + x \cdot [\cos(x^2) \cdot (2x)] \\ &= \sin(x^2) + 2x^2 \cos(x^2) \end{aligned}$$