

Worked Solutions

Pure Maths, Differential Calculus,

sheet PM-DIFF-PR-01

The Product Rule Q.7

differentiate the function $y = 4x\cos(x^3)$

The **Product Rule** states that if $y = u(x) \cdot v(x)$

then:

$$\frac{dy}{dx} = \frac{du}{dx} \cdot v(x) + u(x) \cdot \frac{dv}{dx}$$

let $u(x) = 4x$, then $\frac{du}{dx} = 4$

let $v(x) = \cos(x^3)$, then $\frac{dv}{dx} = -3x^2 \sin(x^3)$ *
(*Chain Rule)

substituting into the Product Rule equation:

$$\frac{dy}{dx} = 4 \cdot \cos(x^3) + 4x \cdot (-3x^2 \sin(x^3))$$

simplifying,

$$\frac{dy}{dx} = 4\cos(x^3) - 12x^3 \sin(x^3)$$
