

Worked Solutions

Pure Maths, Differential Calculus,

sheet PM-DIFF-PR-01

The Product Rule Q.6

differentiate the function $y = x \cos(x^2)$

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 $u(x) = x$, then $\frac{du}{dx} = 1$

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

substituting into the Product Rule equation:

$$\frac{dy}{dx} = 1 \cdot \cos(x^2) + x \cdot (-2x \sin(x^2))$$

simplifying,

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