

Worked Solutions

Pure Maths, Differential Calculus,

sheet PM-DIFF-PR-01

The Product Rule Q.4

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

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 $v(x) = \cos(3x)$, then $\frac{dv}{dx} = -3\sin(3x)$ *

*Chain Rule

substituting into the Product Rule equation:

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

simplifying,

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