Worked Solutions

The Product Rule Q.9

differentiate the function $y = 3x^2 sin(2x)$

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 $u(x) = 3x^2$ then $\frac{du}{dx} = 6x$

let $v(x) = sin(2x)$ then $\frac{dv}{dx} = 2cos(2x)$

(Chain Rule)

substituting into the Product Rule equation:

$$\frac{dy}{dx} = 6x \cdot sin(2x) + 3x^2 \cdot 2cos(2x)$$

simplifying:

$$\frac{dy}{dx} = 6x\,\sin(2x) + 6x^2\cos(2x)$$