

## Worked Solutions

Pure Maths, Differential Calculus,

sheet PM-DIFF-PR-01

### The Product Rule Q.8

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

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

let  $v(x) = \cos^2(x)$

then  $\frac{dv}{dx} = 2\cos(x) \cdot (-\sin(x)) = -2\cos(x)\sin(x)$

substituting into the Product Rule equation:

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

simplifying the expression:

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

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