

## Worked Solutions

Pure Maths, Differential Calculus,

sheet PM\_DIF\_TF\_01

### Trigonometrical Functions Q.2

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

The **Chain Rule** is used when differentiating a 'composite function', which is described as a function of another function.

The derivatives of the functions are linked by the equation:

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

for  $y = \cos(4x)$ , let  $u$  be the inner function,  $u = 4x$

then the outer function is  $y = \cos(u)$

taking derivatives with respect to  $u$  and  $y$  respectively,

$$\frac{du}{dx} = 4 \quad \text{and} \quad \frac{dy}{du} = -\sin(u)$$

substituting these derivatives into the Chain Rule equation,

$$\frac{dy}{dx} = -\sin(u) \cdot 4$$

substituting for  $u = 4x$ ,

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

simplifying,

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

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