

Worked Solutions

Pure Maths, Differential Calculus,

sheet PM_DIF_TF_01

Trigonometrical Functions Q.4

differentiate the function $y = \frac{1}{\cos(2x)}$

recalling that, $\frac{1}{\cos(2x)} = \sec(2x)$,

substituting into the original function, $y = \sec(2x)$

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 $y = \sec(2x)$, let u be the inner function, $u = 2x$

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

taking derivatives with respect to u and y respectively,

$$\frac{du}{dx} = 2 \quad \text{and} \quad \frac{dy}{du} = \sec(u) \tan(u)$$

substituting these results into the Chain Rule equation,

$$\frac{dy}{dx} = \sec(u) \tan(u) \cdot 2$$

substituting for $u = 2x$,

$$\frac{dy}{dx} = \sec(2x) \tan(2x) \cdot 2$$

simplifying,

$$\frac{dy}{dx} = 2\sec(2x) \tan(2x)$$
