Worked Solutions

Pure Maths, Differential Calculus, sheet PM_DIF_TF_01

Trigonometrical Functions Q.6

differentiate the function $y = \frac{1}{tan(5x)}$

recalling that, $\frac{1}{tan(5x)} = cot(5x)$,

substituting into the original function, $y = cot(5x)$

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 $y = cot(5x)$, let u be the inner function, $u = 5x$

then the outer function is $y = cot(u)$

taking derivatives with respect to u and y respectively,

$$5 \qquad \text{and} \qquad \frac{dy}{du} = \; - \; csc^2(u)$$

substituting these results into the Chain Rule equation,

$$\frac{dy}{dx} = \; - \; csc^2(u) \cdot 5$$

substituting for $u = \; 5x,$

$$\frac{dy}{dx} = \; - \; csc^2(5x) \; \cdot 5$$

simplifying,

$$\frac{dy}{dx} = \; - \; 5 \, csc^2(5x)$$
