Worked Solutions

Trigonometrical Functions Q.5

differentiate the function $y = \dfrac{1}{sin(4x)}$

recalling that, $\dfrac{1}{sin(4x)} = csc(4x)$,

substituting into the original function, $y = csc(4x)$

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 $y = csc(4x)$,   let u be the inner function, $u = 4x$

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

taking derivatives with respect to u and y respectively,

$$\frac{du}{dx} = 4 \qquad \text{and} \qquad \frac{dy}{du} = -\csc(u)\cot(u)$$

substituting these results into the Chain Rule equation,

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

substituting for $u = 4x$,

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

simplifying,

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