Worked Solutions

Pure Maths, Differential Calculus, sheet PM_DIF_TF_01

Trigonometrical Functions Q.10

differentiate the function $y = \frac{1}{tan(3-2x)}$

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:

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

remembering that $\frac{1}{tan(3-2x)} = cot(3-2x)$

for $y = cot(3-2x)$

let u be the inner function, $u = 3-2x$

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

taking derivatives with respect to u and y respectively,

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

substituting these results into the Chain Rule equation,

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

substituting for $u = 3 - 2x$,

$$\frac{dy}{dx} = -csc^2\left(3 - 2x\right) \cdot -2$$

simplifying,

$$\frac{dy}{dx} = 2\,csc^2\left(3 - 2x\right)$$
