

Worked Solutions

Pure Maths, Differential Calculus,

sheet PM_DIF_QR_01

The Quotient Rule Q.4

differentiate the function $y = \frac{x-2}{x^2+3}$

The **Quotient Rule** for differentiation states that for a function defined as:

$$y = \frac{u}{v}$$

where both u and v are differentiable functions of x , then the derivative of y with respect to x is given by:

$$\frac{dy}{dx} = \frac{v \cdot \frac{du}{dx} - u \cdot \frac{dv}{dx}}{v^2}$$

let $u = x - 2$ and $v = x^2 + 3$

then $\frac{du}{dx} = 1$ and $\frac{dv}{dx} = 2x$

substituting into the Quotient Rule equation,

$$\frac{dy}{dx} = \frac{(x^2 + 3) \cdot 1 - (x - 2) \cdot 2x}{(x^2 + 3)^2}$$

simplifying,

$$\frac{dy}{dx} = \frac{(x^2 + 3) - 2x(x - 2)}{(x^2 + 3)^2}$$

$$= \frac{x^2 + 3 - 2x^2 + 4x}{(x^2 + 3)^2}$$

$$= \frac{-x^2 + 4x + 3}{(x^2 + 3)^2}$$

answer,

$$\frac{dy}{dx} = \frac{-x^2 + 4x + 3}{(x^2 + 3)^2}$$
