

Worked Solutions

Pure Maths, Differential Calculus,

sheet PM_DIF_QR_01

The Quotient Rule Q.5

differentiate the function $y = \frac{x^2 + 4}{x - 1}$

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 $u = x^2 + 4$ and $v = x - 1$

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

substituting into the Quotient Rule equation,

$$\frac{dy}{dx} = \frac{(x-1) \cdot 2x - (x^2+4) \cdot 1}{(x-1)^2}$$

simplifying,

$$\frac{dy}{dx} = \frac{2x(x-1) - (x^2+4)}{(x-1)^2}$$

$$= \frac{2x^2 - 2x - x^2 - 4}{(x-1)^2}$$

$$= \frac{x^2 - 2x - 4}{(x-1)^2}$$

answer,

$$\frac{dy}{dx} = \frac{x^2 - 2x - 4}{(x-1)^2}$$
