

Worked Solutions

Pure Maths, Differential Calculus,

sheet PM_DIF_QR_01

The Quotient Rule Q.2

differentiate the function $y = \frac{4x}{x+3}$

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:

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

let $u = 4x$ and $v = x + 3$

then, $\frac{du}{dx} = 4$ and $\frac{dv}{dx} = 1$

substituting into the Quotient Rule equation,

$$\frac{dy}{dx} = \frac{(x+3) \cdot 4 - 4x \cdot 1}{(x+3)^2}$$

simplifying,

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

$$= \frac{4x + 12 - 4x}{(x+3)^2}$$

$$= \frac{12}{(x+3)^2}$$

answer,

$$\frac{dy}{dx} = \frac{12}{(x+3)^2}$$
