Worked Solutions

Pure Maths, Differential Calculus, sheet PM_DIF_QR_01

The Quotient Rule Q.1

differentiate the function $y = \frac{x}{x+2}$ using the Quotient Rule

The **Quotient Rule** for differentiation states that if you have 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 $u = x$ and $v = (x + 2)$

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

substituting into the Quotient Rule equation:

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

simplifying,

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

hence,

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