

Worked Solutions

Pure Maths, Differential Calculus,

sheet PM_DIF_QR_01

The Quotient Rule Q.10

differentiate the function $y = \frac{3-x^4}{x^2+2}$

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 $u = 3 - x^4$ and $v = x^2 + 2$

then $\frac{du}{dx} = -4x^3$ and $\frac{dv}{dx} = 2x$

substituting into the Quotient Rule equation,

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

simplifying,

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

$$= \frac{-4x^5 - 8x^3 - 6x + 2x^5}{(x^2 + 2)^2}$$

$$= \frac{-2x^5 - 8x^3 - 6x}{(x^2 + 2)^2}$$

answer,

$$\frac{dy}{dx} = \frac{-2x^5 - 8x^3 - 6x}{(x^2 + 2)^2}$$
