



Differentiation

1. Given that $y = \frac{x^4}{4} - \frac{4}{x^4}$ $-4x^{-4}$

Find $\frac{dy}{dx}$

$$\begin{aligned} \frac{dy}{dx} &= \frac{4x^3}{4} + 16x^{-5} \\ &= x^3 + \frac{16}{x^5} \end{aligned}$$

The Maths Society

$$\frac{dy}{dx} = x^3 + \frac{16}{x^5}$$

2. Given that $y = x^4 - \frac{8}{x^2}$ $-8x^{-2}$

Find $\frac{dy}{dx}$

$$\begin{aligned} \frac{dy}{dx} &= 4x^3 + 16x^{-3} \\ &= 4x^3 + \frac{16}{x^3} \end{aligned}$$

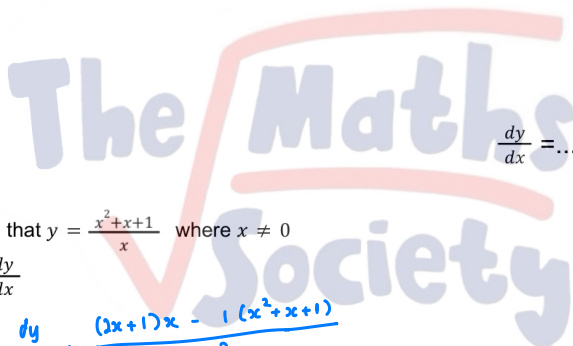
$$\frac{dy}{dx} = 4x^3 + \frac{16}{x^3}$$

The Maths Society

3. Given that $y = 3x^6 - \frac{4}{x^3}$ $-4x^{-3}$

Find $\frac{dy}{dx}$

$$\begin{aligned} \frac{dy}{dx} &= 18x^5 + 12x^{-4} \\ &= 18x^5 + \frac{12}{x^4} \end{aligned}$$



$$\frac{dy}{dx} = \frac{18x^5 + 12}{x^4}$$

4. Given that $y = \frac{x^2+x+1}{x}$ where $x \neq 0$

find $\frac{dy}{dx}$

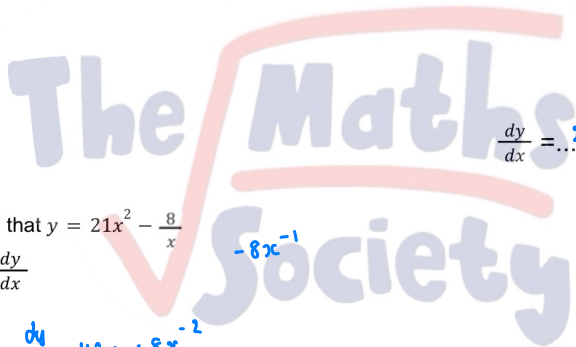
$$\begin{aligned} \frac{dy}{dx} &= \frac{(2x+1)x - 1(x^2+x+1)}{x^2} \\ &= \frac{2x^2 + x - x^2 - x - 1}{x^2} \\ &= \frac{x^2 - 1}{x^2} \end{aligned}$$

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

5. $y = 4x^5 - \frac{8}{x^2}$ $-8x^{-2}$

Find $\frac{dy}{dx}$

$$\begin{aligned} \frac{dy}{dx} &= 20x^4 + 16x^{-3} \\ &= 20x^4 + \frac{16}{x^3} \end{aligned}$$



$$\frac{dy}{dx} = 20x^4 + \frac{16}{x^3} \dots$$

6. Given that $y = 21x^2 - \frac{8}{x}$ $-8x^{-1}$

Find $\frac{dy}{dx}$

$$\begin{aligned} \frac{dy}{dx} &= 42x + 8x^{-2} \\ &= 42x + \frac{8}{x^2} \end{aligned}$$

$$\frac{dy}{dx} = 42x + \frac{8}{x^2} \dots$$

The Maths Society