

4. Integrate $x(2x^2+1)^{1/2}$

$$\int x(2x^2+1)^{1/2}$$

let u be $2x^2+1$

$$du/dx = 4x$$

$$\therefore dx = \frac{du}{4x}$$

$$\therefore dx = \frac{1}{4} \int \sqrt{u} du$$

Apply power rule

$$\int \sqrt{u} du = \frac{2u^{3/2}}{3}$$

$$\frac{1}{4} \times \frac{2u^{3/2}}{3}$$

$$\frac{1}{4} \times \frac{2u^{3/2}}{3}$$

$$= \frac{u^{3/2}}{6}$$

$$\therefore \int_0^2 (2x^2+1)^{3/2}$$

$$= \frac{(2(2)^2+1)^{3/2}}{6} - \frac{(2(0)^2+1)^{3/2}}{6}$$

$$= \frac{3^3}{6}$$

$$= 4.5$$

Chukwumerie Excellence

Chemical Engineering

10/ENCO1005

1. $y = (2x^2 + 3) / \ln 2x$

$$dy/dx = \frac{d/dx [2x^2 + 3] \cdot \ln(2x) - (2x^2 + 3) \cdot d/dx [\ln(2x)]}{\ln^2(2x)}$$

$$dy/dx = \frac{(2 \cdot d/dx [x^2] + d/dx [3]) \ln(2x) - (2x^2 + 3) \cdot 1/2x \cdot d/dx [2x]}{\ln^2(2x)}$$

$$dy/dx = \frac{(2 \cdot 2x + 0) \ln(2x) - (2x^2 + 3) \cdot 1/x}{\ln^2(2x)}$$

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

$$dy/dx = \frac{4(2.5) - 2(2.5)^2 + 3}{\ln(5) \cdot 2.5 \ln^2(5)}$$

$$dy/dx = 3.82$$

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

$$dy/dx = \frac{2(1(x^2 - 5) - (d/dx [x^2] + d/dx [-5])x)}{(x^2 - 5)^2}$$

$$dy/dx = \frac{2(-x^2 - 5)}{(x^2 - 5)^2}$$

$$dy/dx = \frac{2}{x^2 - 5} - \frac{4x^2}{(x^2 - 5)^2}$$

when $x = 2$

$$dy/dx = \frac{2}{4 - 5} - \frac{16}{(4 - 5)^2}$$

$$dy/dx = -18$$

3. $Z = 2x^3 \ln y$

$$dZ/dy = 2x^3 \cdot \frac{1}{y}$$

$$dZ/dy = \frac{2x^3}{y}$$