

TADESE VICTOR ADEDAMOJA

ELECT/ELECT ENGINEERING

19/ENG04/055

MAT 104 ASSIGNMENT

$$1) \quad y = \frac{2x^2+3}{\ln 2x} = \frac{u}{v} \quad \frac{dy}{dx} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$$

$$\frac{du}{dx} = 4x \quad \frac{dv}{dx} = \frac{1}{2x} \times 2 = \frac{1}{x}$$

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

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

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

at $x = 2.5$

$$\frac{dy}{dx} = \frac{10}{\ln 5} - \frac{5}{(\ln 5)^2} - \frac{3}{2.5(\ln 5)^2}$$

$$\frac{dy}{dx} = \cancel{10} \quad 3.824$$

$$2) \quad y = \frac{2x}{(x^2-5)} = \frac{u}{v}$$

$$\frac{du}{dx} = 2 \quad \frac{dv}{dx} = 2x$$

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

$$\frac{dy}{dx} = \frac{2x^2 - 10 - 4x^2}{x^4 - 5x^2 - 5x^2 + 25}$$

$$\frac{dy}{dx} = \frac{-2x^2 - 10}{x^4 - 10x^2 + 25}$$

at (2, -4)

$$\text{gradient} = \frac{dy}{dx} = \frac{-8 - 10}{16 - 40 + 25} = \frac{-18}{1}$$

at (2, -4) $dy/dx = -18$

$$3 \quad z = 2x^3 \ln y$$

$$dz/dy = 2x^3 \cdot d \ln y / dy$$

$$\frac{dz}{dy} = 2x^3 \times \frac{1}{y} = \frac{2x^3}{y}$$

$$4 \int_0^2 x(2x^2+1)^{1/2}$$

$$\text{let } u = 2x^2 + 1$$

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

$$\int_0^2 \frac{x u^{1/2} du}{4x} = \int_0^2 \frac{u^{1/2}}{4} du$$

$$= \left[\frac{(2x^2+1)^{3/2}}{6} \right]_0^2$$

$$= \left(\frac{9^{3/2}}{6} - \frac{1^{3/2}}{6} \right)$$

$$= 4.5 - 0.167 = 4.334$$