Name: Chidera Christogonus Ndubisi
Dept: Electrical and Electronics Engineering
Matric Number: 19/ENG04/012

Math 104

Assignment:

(1) Evaluate dy/dx at $x = 2.5$, Correct to 3 Significant figures given $y = \frac{[2x^2+3]}{\ln 2x}$

Soln

$y = \frac{2x^2+3}{\ln 2x}$ ∴ Applying the quotient rule. $\left[\frac{V\frac{du}{dx} - U\frac{dv}{dx}}{V^2}\right]$

let $u = 2x^2+3$, $V = \ln 2x$

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

$= \frac{(\ln 2x)\cdot(4x) - (2x^2+3)\cdot(\frac{1}{x})}{(\ln 2x)^2}$

∴ at $x = 2.5$

$\frac{\ln 2(2.5)\cdot 4(2.5) - (2(2.5)^2+3)\cdot\frac{1}{2.5}}{[\ln 2(2.5)]^2} = \frac{9.89}{2.59} = 3.8185$

≈ 3.82 [3 significant figure]

(2)

Find the gradient of the curve $y = \frac{2x}{(x^2-5)}$ at the Point (2,-4)

Soln let $U = 2x$, $V = (x^2-5)$

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

∴ Applying the quotient Rule.

∴ at (2,-4)

$\frac{V\frac{du}{dx} - U\frac{dv}{dx}}{V^2} = \frac{(x^2-5)(2) - (2(x))(2x)}{((x)^2-5)^2} = \frac{2x^2-4x^2-10}{(x^2-5)^2} = \frac{-2x^2-10}{(x^2-5)^2}$

$\left.\frac{dy}{dx}\right|_{(2,-4)} = \frac{-2(2)^2-10}{[(2)^2-5]^2} = \frac{-18}{1}$

∴ The gradient of the curve

$= -18$

(3)

If $z = 2x^3 \ln y$ find dz/dy

Solu

$$\ln z = \ln(2x^3) + \ln(\ln y)$$

$$\frac{1}{z}\cdot\frac{dz}{dy} = \frac{1}{2x^3}\cdot 6x^2\frac{dx}{dy} + \frac{1}{\ln y}\cdot\frac{1}{y}$$

$$\frac{1}{z}\cdot\frac{dz}{dy} = \frac{3\cancel{6}x^2}{\cancel{2}x^3}\frac{dx}{dy} + \frac{1}{y\ln y}$$

$$\frac{dz}{dy} = z\left[\frac{3}{x}\frac{dx}{dy} + \frac{1}{y\ln y}\right]$$

$$\frac{dz}{dy} = 2x^3\ln y\left[\frac{3dx}{xdy} + \frac{1}{y\ln y}\right]$$

$$\frac{dz}{dy} = 6x^2\ln y\frac{dx}{dy} + \frac{2x^3}{y}$$

(4)

Integrate $x(2x^2+1)^{1/2}$ with respect to x from $(0$ to $2)$

Soly

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

let $u = 2x^2+1$, $\frac{du}{dx} = 4x$ $\therefore dx = \frac{du}{4x}$

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

$$\therefore \int u^{1/2} = \frac{2u^{3/2}}{3} \quad \therefore \frac{1}{4}\int_0^2 \frac{2u^{3/2}}{3}\,du$$

$$= \frac{u^{3/2}}{6}$$ recall $u = 2x^2+1$ $\therefore$ $\int \frac{[2x^2+1]^{3/2}}{6}$

$$\int_0^2 \frac{(2x^2+1)^{3/2}}{6}$$

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

$$= \frac{[9]^{3/2}}{6} - \frac{[1]^{3/2}}{6} = 4.33$$