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COMPUTER ENGINEERING (19/ENG02/054)
MAT 104 Assignment (Serial No: 130)
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1) $y = \dfrac{(2x^2+3)}{\ln 2x} \quad \begin{matrix} u \\ v \end{matrix}$

$$\frac{dy}{dx} = \frac{v\, du/dx - u\, dv/dx}{v^2}$$

$\Rightarrow v = \ln 2x \;;\; dv/dx = 1/x$

$u = 2x^2+3 \;;\; du/dx = 4x$

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

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

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

If $x = 2.5 \quad \therefore \dfrac{dy}{dx} = \dfrac{[4(2.5)\ln 2(2.5) - 2(2.5) - (3/2.5)]}{\ln^2(2(2.5))}$

$dy/dx = 3.81979532$

3 significant fig $\simeq$ $\underline{3.819}$

2) $y = \dfrac{2x}{(x^2-5)}$ gradient $= dy/dx$

$$\frac{dy}{dx} = \frac{v\, du/dx - u\, dv/dx}{v^2}$$

$V = x^2 - 5$; $dv/dx = 2x$

$u = 2x$; $du/dx = 2$

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

$$\frac{dy}{dx} = \frac{2x^2 - 10 - 4x^2}{(x^2-5)^2}$$

at point 2, -4 , $x = 2$

$$\frac{dy}{dx} = \frac{2(2)^2 - 10 - 4(2)^2}{((2)^2-5)^2}$$

$$\frac{dy}{dx} = \frac{8 - 10 - 16}{1} = -18$$

Gradient of the curve = $\underline{-18}$

(3) $Z = 2x^3 \ln y$, find dz/dy

$$\frac{dz}{dy} = V\frac{du}{dy} + U\frac{dv}{dy}$$

where $U = 2x^3$; $du/dy = 0$

$V = \ln y$; $dv/dy = 1/y$

$$\frac{dz}{dy} = \ln y(0) + 2x^3\left[\frac{1}{y}\right]$$

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

4 $$\frac{dy}{dx} = x(2x^2+1)^{1/2}$$

$$dy = x(2x^2+1)^{1/2} \cdot dx$$

$$\int dy = x(2x^2+1)^{1/2} \cdot dx$$

$$y = \int x(2x^2+1)^{1/2}\, dx$$

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

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

$$y = \int x\sqrt{u} \cdot \frac{du}{4x}$$

$$y = \frac{1}{4}\int \frac{\cancel{x}\sqrt{u}}{\cancel{x}} \cdot du$$

$$y = \frac{1}{4}\int u^{1/2}\, du$$

$$y = \frac{1}{4} \cdot \left[\frac{u^{3/2}}{3/2}\right]$$

$$y = \frac{1}{\cancel{4}\,2} \cdot \frac{\cancel{2}u^{3/2}}{3}$$

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

Recall that $u = 2x^2+1$

$$\therefore y = \frac{(2x^2+1)^{3/2}}{6} + C$$

from 0 to 2 $y = \int_0^2 f(x)\, dx$

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

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

$$y = \frac{9}{2} - \frac{1}{6} = \frac{13}{3} \text{ or } 4.33$$