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PT: COMPUTER ENGINEERING
RIC NO: 19/ENG02/078
URSE: MAT 104 Assignment

$\frac{dy}{dx}\left(\frac{2x^2+8}{\ln(2x)}\right)$

$$\frac{\frac{d}{dx}[2x^2+3]\cdot \ln(2x) - (2x^2+8)\cdot \frac{d}{dx}[\ln(2x)]}{\ln^2(2x)}$$

$$\frac{(2\cdot \frac{d}{dx}(x^2) + \frac{d}{dx}(31))\ln(2x) - (2x^2+3)\cdot \frac{1}{2x}\cdot \frac{d}{dx}(2x)}{\ln^2(2x)}$$

$$\frac{(2\cdot 2x+0)\ln(2x) - (2x^2+3)\cdot \frac{d}{2x}(x)}{\ln^2(2x)}$$

$$= \frac{4x\ln(2x) - \frac{(2x^2+8)\cdot 1}{x}}{\ln^2(2x)}$$

$$= \frac{4x}{\ln(2x)} - \frac{2x^2+3}{x\ln^2(2x)} \quad \text{at } x = 2.5$$

$$\frac{4(2.5)}{\ln(2(2.5))} - \frac{2(2.5)^2+3}{(2.5)\ln^2(2(2.5))}$$

$$= 3.8198 \doteq 3.82 \text{ to } 3\text{sf}$$

$\frac{d}{dx}\left[\frac{2x}{x^2-5}\right]$

$$= 2\cdot \frac{d}{dx}\left[\frac{x}{x^2-5}\right]$$

$$= 2\cdot \frac{\frac{d}{dx}[x]\cdot(x^2-5) - x\cdot \frac{d}{dx}(x^2-5)}{(x^2-5)^2}$$

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

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

$$= \frac{2(x^2-(2x+0)x-5)}{(x^2-5)^2}$$

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

$$\frac{-2(0)^2-10}{(0)^2-5)^2} = -\frac{10}{1} \rightarrow \text{Gradient} = -10$$

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

$u = 2x^3 \quad v = \ln y$

$\frac{du}{dy} = 6x^2 \frac{dx}{dy} \qquad \frac{dv}{dy} = \frac{1}{y}$

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

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

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

let $u = 2x^2 + 1$

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

$du = dx\, 4x$

$dx = du/4x$

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

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

$\frac{1}{4} \left[\frac{u^{3/2}}{3/2} \right]_0^2$

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

$= \frac{1}{6}[27 - 1]$

$\frac{1}{6}(26)$

$= 4.333 \simeq 433$