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DEPARTMENT: COMPUTER ENGINEERING

MATRIC NO: 19/ENG02/1004

1 $dy/dx \; (2x^2+3)/\ln(2x)$

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

$$\frac{2\cdot \frac{d}{dx}[x^2] + \frac{d}{dx}[13]\ln(2x) - (2x^2+3)\cdot \frac{1}{2x}\cdot \frac{d}{dx}[2x]}{\ln^2(2x)}$$

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

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

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

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

at $x = 2.5$

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

$$= 3.8198 = 3.82 \text{ to } 3 \text{ s.f}$$

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

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

$$= \frac{2\left(1(6x^2-5) - \left([x^2]' + \frac{d}{dx}[-5]x\right)\right)}{(3x^2-5)^2}$$

$$= \frac{2\left(1(3x^2-5) - \left(\frac{d}{dx}[3x^2]\right] + dy/dx\,[-5]x\right]}{(3x^2-5)^2}$$

$$= \frac{2(x^2-(3x+0)x-5)}{(3x^2-5^2)}$$

$$= \frac{2(-3x^2-5)}{x^2-5)^2}$$

at $x=2$

$$\frac{-2(2)^2-10}{[(2)^2-5]^2}$$

$$= -\frac{18}{1} \quad \text{Gradient} = -18$$

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

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

$\frac{du}{dy} = 6x^2 \quad \frac{dv}{dy} = 1/y$

$\frac{dz}{dy} = u\frac{dv}{dx} + v\frac{du}{dx}$

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

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

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

let $u = 2x^2+1$

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

~~Let $u = 2x^2 + 1$~~

$du = dx\, 4x$

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

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

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

~~$\int_0^2$~~ $\frac{1}{4}\left[\frac{u^{3/2}}{3/2}\right]_0^2$

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

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

$= \frac{1}{6}[26]$

$= 4.333 = 4.33,,$