Ifeoluwa Promise
19/ENG02/021
Computer Engineering.

(1) $\frac{dy}{dx}\left[\frac{(2x^2+3)}{\ln(2x)}\right]$

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

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

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

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

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

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

at $x=2.5$

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

$= 3.8198 \simeq 3.82$ (3 s.f.)

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

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

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

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

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

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

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

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

$= \frac{-18}{1}$

Gradient $= -18$

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

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

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

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

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

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

let $u = 2x^2+1$

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

$du = dx\,4x$

$dx = du/4x$.

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

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

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

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

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

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

$= 4.333 \simeq 4.33$.