~~Q~~

$$= \frac{1}{4}\left[\frac{2(2x^2+1)^{3/2}}{3}\right]_0^2$$

$$= \frac{1}{4}\left[\left(\frac{2(2(2)^2+1)^{3/2}}{3} - \frac{2(2(0)^2+1)^{3/2}}{3}\right)\right]$$

$$= \frac{1}{4}\left[\frac{52}{3}\right]$$

$$= \frac{13}{3}$$

~~A~~ ALIYU BASHIR DAURA
Electrical Engineering 19/eng04/010

(1) $y = \dfrac{(2x^2+3)}{\ln 2x}$

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

$\dfrac{1}{y}\cdot\dfrac{dy}{dx} = \dfrac{1}{2x^2+3}\cdot 4x - \dfrac{1}{\ln 2x}\cdot\dfrac{\cancel{2}}{\cancel{2}x}$

$\dfrac{dy}{dx} = y\left(\dfrac{4x}{2x^2+3} - \dfrac{1}{x\ln 2x}\right)$

$\dfrac{dy}{dx} = \dfrac{(2x^2+3)}{\ln 2x}\left(\dfrac{4x}{2x^2+3} - \dfrac{1}{x\ln 2x}\right)$

When $x = 2.5$, $\dfrac{dy}{dx} = \dfrac{2(2.5^2)+3}{\ln 2(2.5)}$

$\left(\dfrac{4(2.5)}{2(2.5^2)+3} - \dfrac{1}{2.5\ln(2\times 2.5)}\right)$

$= 3.82$

2) $y = \dfrac{2x}{x^2-5}$

$\ln y = \ln 2x - \ln x^2-5$

$\dfrac{1}{y}\cdot\dfrac{dy}{dx} = \dfrac{1}{2x}\cdot 2 - \dfrac{1}{x^2-5}\cdot 2x$

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

$$= \frac{2x}{x^2-5}\left(\frac{1}{x} - \frac{2x}{x^2-5}\right)$$

at $x = 2.4$

$$\therefore \frac{dy}{dx} = \underline{\underline{-37.26}}$$

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

$$\frac{dz}{dy} = \frac{1}{y}$$

4) $$\int_0^2 x(2x^2+1)^{\frac{1}{2}} \, dx = \int_0^2 x\sqrt{2x^2+1}\, dx$$

let $u = 2x^2+1$

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

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

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

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