NAME: ALONYENU TREASURE AGBENU-OWO

DEPARTMENT: CIVIL ENGINEERING

MARTIC NUMBER: 19/ENG03/005

MAT 104 ASSIGNMENT

✓ Alonrenri Treasure Agberri-Oro
✓ Civil Engineering
✓ 19/ENG03/005
✓ MAT 104 Assignment

① $y = \dfrac{(2x^3 + 3)}{\ln 2x}$

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

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

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

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

when $x = 2.5$, $\dfrac{dy}{dx} = \dfrac{2(2.5)^2 + 3}{\ln 2(2.5)}\left[\dfrac{4(2.5)}{2(2.5)^2 + 3} - \dfrac{1}{2.5 \ln(2 \times 2.5)}\right]$

$= 3.82$ to 3s.f

② $y = \dfrac{2x}{x^2 - 5}$

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

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

$\dfrac{dy}{dx} = y\left(\dfrac{1}{2x} - \dfrac{2x}{x^2 - 5}\right)$

$\dfrac{dy}{dx} = \dfrac{2x}{x^2 - 5}\left(\dfrac{1}{x} - \dfrac{2x}{x^2 - 5}\right)$

at $x = 2.4$

$\dfrac{dy}{dx} = -37.26$

③ $z = 2x^3 \ln y$

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

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

let $u = 2x^2 + 1$

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

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

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

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

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

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

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

$= \dfrac{13}{3}$