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DEPARTMENT: MECHANICAL ENGINEERING

MATRIC NO.: 19/ENG06/043

SERIAL NO.: 108

COURSE: MAT104

ASSIGNMENT

1)  $y = \frac{2x^2+3}{\ln 2x}$   
 $u = 2x^2+3$   
 $\frac{du}{dx} = 4x$   
 $v = \ln 2x$   
 $\frac{dv}{dx} = \frac{1}{x}$   
 $\frac{dy}{dx} = v \frac{du}{dx} - u \frac{dv}{dx}$   
 $= \frac{(\ln 2x) \cdot (4x) - (2x^2+3) \cdot \frac{1}{x}}{(\ln 2x)^2}$   
 $= \frac{4x \ln 2x - 2x - \frac{3}{x}}{(\ln 2x)^2}$   
when  $x = 2.5$   
 $= \frac{4(2.5) \ln 2(2.5) - 2(2.5) - \frac{3}{2.5}}{(\ln 2(2.5))^2}$   
 $= \frac{10 \times 1.61 - 5 - 1.2}{2.59}$   
 $= \frac{16.1 - 6.2}{2.59}$   
 $= 3.82$  to 3 significant figures

2)  $y = \frac{2x}{x^2-5}$   
 $u = 2x$   
 $\frac{du}{dx} = 2$

$$v = x^2 - 5$$

$$\frac{dv}{dx} = 2x$$

$$\frac{dy}{dx} = \frac{v \frac{dv}{dx} - u \frac{dv}{dx}}{v^2}$$

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

$$= \frac{2x^2 - 10 - 4x^2}{(x^2 - 5)^2}$$

when  $x = 2$

$$m = \frac{2(2)^2 - 10 - 4(2)^2}{(2^2 - 5)^2}$$

$$= \frac{8 - 10 - 16}{(4 - 5)^2}$$

$$= \frac{-18}{(-1)^2}$$

$$= -18$$

$$m = -18$$

3)  $z = 2x^3$  tang with respect to  $y$

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

4)  $\int \frac{dx}{\sqrt{2x^2 + 1}}$

$$u = \sqrt{2x^2 + 1}$$

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

$$2x^2 = u^2 - 1$$

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

$$\frac{dx}{du} = \frac{1}{2} \left( \frac{u^2 - 1}{2} \right)^{-1/2} \cdot 2u$$

$$\frac{dx}{du} = u \left( \frac{2}{u^2 - 1} \right)^{1/2}$$

$$dx = u du \left( \frac{2}{u^2-1} \right)^{1/2}$$

$$= \int_0^2 \left( \frac{u^2-1}{2} \right)^{1/2} \cdot u \cdot u du \left( \frac{u^2-1}{2} \right)^{-1/2}$$

$$= \int_0^2 \left( \frac{u^2-1}{2} \right)^{1/2-1/2} \cdot u^2 du$$

$$= \int_0^2 u^2 du$$

$$= \left[ \frac{u^3}{3} \right]_0^2$$

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

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

$$= \left[ \frac{9^{3/2}}{3} \right] - \left[ \frac{1^{3/2}}{3} \right]$$

$$= \frac{27}{3} - \frac{1}{3}$$

$$= 9 - \frac{1}{3}$$