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mathematics Assignment.

1)

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

let $u = 2x^2+3$ $\quad v = \ln 2x$

$$\frac{du}{dx} = 4x \qquad \frac{dv}{dx} = \frac{1}{x}$$

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

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

$$\left.\frac{dy}{dx}\right|_{x=2.5} = \frac{4(2.5)\ln 2(2.5) - \frac{1}{2.5}[2(2.5)^2+3]}{[\ln 2(2.5)]^2}$$

$$= \frac{16.0944 - 6.2}{2.5905} = 3.8198 \simeq 3.82 \text{ to 3 s.f}$$

2)

$$y = \frac{2x}{x^2-5}$$

$u = 2x \quad v = x^2-5$

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

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

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

$$\left.\frac{dy}{dx}\right|_{(2,-4)} \quad \therefore m = \frac{-2(2)^2-10}{[(2)^2-5]^2} = \frac{-18}{1}$$

Gradient $= -18$.

3

$z = 2x^3 \ln y$

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

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

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

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

4

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

let $u = 2x^2 + 1$

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

$du = 4x\,dx$

$dx = du/4x$

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

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

$\frac{1}{4}\left\{\frac{u^{3/2}}{3/2}\right\}_0^2 = \frac{1}{6}\left[u^{3/2}\right]_0^2$

$= \frac{1}{6}\left[(2x^2+1)^{3/2}\right]_0^2$

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

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

$\frac{1}{6}[26] = 4.3333 \simeq 4.33$