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MATLO4 ASSIGNMENT.

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

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

$du/dx = 4x$ $dv/dx = 1/x$

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

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

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

$= \frac{16.0944 - 6.2}{2.5903} = 3.8198 \approx \underline{3.82}$ to 3 s.f

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

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

$du/dx = 2$ $dv/dx = 2x$

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

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

$\therefore$ Gradient $= -18$

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

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

$du/dy = 6x^2 \, dx/dy \qquad dv/dy = 1/y$

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

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

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

let $u = 2x^2 + 1$

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

$du = x \, dx$

$dx = du/4x$

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

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

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

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

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

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

$$\frac{1}{6}\left[26\right] = 4.3333 \approx 4.33$$