MAT 104

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Elect / Elect Engr

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(1.) $\dfrac{2x^2+3}{\ln 2x}$; Let $U = 2x^2+3$

$V = \ln 2x$

Hence; $du/dx = 4x$

$dv/dx = 2/2x = 1/x$

$$\frac{dy}{dx} = \frac{V\,du/dx - U\,dv/dx}{V^2}$$

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

where $x = 2.5$

So,

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

$$= \frac{4(2.5)\ln 2(2.5) - 2(2.5)^2+3/(2.5)}{(\ln 2(2.5))^2}$$

$$\frac{dy}{dx} = \frac{17.33 - 6.2}{3}$$

$$dy/dx = 3.71_4$$

(2.) $y = \frac{2x}{x^2 - 5}$ Coordinate $(2, -4)$

Let $U = 2x$
$V = x^2 - 5$

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

$$\frac{dy}{dx} = \frac{V\,du/dx - U\,dv/dx}{V^2}$$

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

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

Where $x = 2$

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

$$= \frac{-8 - 10}{(4 - 5)^2} = \frac{-18}{1} = -18$$

$$m = dy/dx = -18$$

therefore, the gradient at the curve is equal to -18

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

$$\frac{dz}{dy} = 2x^3 \cdot \frac{dz}{dy} (\ln y)$$

$$\frac{dz}{dy} = 2x^3 \cdot \frac{1}{y}$$

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

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

let $u = 2x^2+1$

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

$dx = du/4x$

$= \int x \cdot u^{1/2} \cdot du/4x$

$= \int \frac{u^{1/2}}{4}\ du$

$= \frac{2u^{3/2}}{12}$

$\therefore \int x\sqrt{2x^2+1}\ dx = \frac{2(2x^2+1)^{3/2}}{12}$

$= \frac{(2x^2+1)^{3/2}}{6}$ //