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1) $y = \frac{(2x^2+3)}{\ln 2x}\ u \quad V$ at $x = 2.5$

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

$U = 2x^2 + 3$

$du/dx = 4x$

$V = \ln 2x, \quad dv/dx = 1/2x$

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

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

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

at $x = 2.5$

$$\frac{dy}{dx} = \frac{10}{\ln 5} - \frac{15.5 \times 1/5}{(\ln 5)^2}$$

$$\frac{dy}{dx} = \frac{10}{1.6099} - \frac{3.1}{2.5902}$$

$$\frac{dy}{dx} = 6.2133 - 1.1967$$

$$dy/dx = 5.01657$$

$dy/dx \approx 5.02$ to 3 S.f

2) $y = 2x/(x^2-5)$ at point $(2,-4)$

$y = \frac{2x}{x^2-5} \cdot 4$

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

$\frac{du}{dx} = 2$

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

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

$\frac{dy}{dx} = \frac{2x^2-10-4x^2}{x^4-10x^2+25}$

$y - y_1 = m(x-x_1)$

$m = dy/dx$

$m = \frac{2x^2-10-4x^2}{x^4-10x^2+25}$

at $x=2$

$m = \frac{2(2)^2-10-4(2)^3}{(2)^4-10(2)^2+25}$

$m = \frac{8-10-16}{16-40+25} = \frac{-18}{1}$

$m = -18$

at $x=-4$

$$m = \frac{2(-4)^2 - 10 - 4(-4)^2}{(-4)^4 - 10(-4)^2 + 25}$$

$$m = \frac{32 - 10 - 64}{256 - 160 + 25} = \frac{-42}{121}$$

$$m = -0.35$$

$m = -18$ and $m = -0.35$ //

8) $Z = 2x^3 \ln y$

$$\frac{dz}{dy} = 3$$

$$\therefore 6x^2 \ln y \frac{dz}{dy} + 2x^3 \frac{1}{y} = 0$$

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

$$\frac{dz}{dy} = \frac{-2x^3}{y} \Big/ 6x^2 \ln y$$

$$\frac{dz}{dy} = \frac{-2x^3/y}{6x^2 \ln y}$$ //

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

Let $u = 2x^2 + 1$

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

$du = 4x\,dx$

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

$u = 2x^2 + 1$

$2x^2 = u - 1$

$x^2 = \frac{u-1}{2}$

$x = \sqrt{u - 1/2}$

$\int x \cdot \sqrt{u}\ du/2x$

$\int_0^2 \sqrt{\frac{u-1}{2}}\ \sqrt{u}\ du/2x$

$\int_0^2 \sqrt{\frac{2x^2+1-1}{2}}\ \sqrt{2x^2+1}\ dy/4x$

$\int_0^2 \sqrt{\frac{2x^2}{2}}\ \sqrt{2x^2+1}\ du/2x$

$\int_0^2 x \cdot (2x^2+1)^{1/2}$

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

When $x = 2$

$$\frac{4}{2} \times (9)^{3/2}$$

$$2 \times 27^{3/2}$$

$$2 \times 18$$

$$= 36$$

at $x = 0 = 0$

upper bound − lower bound

$$= 36 - 0$$

$$\therefore \int_0^2 \alpha (2x^2 + 1)\, dx$$

$$= 36$$