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Elect/Elect

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

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

when $x = 2.5$

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

$$\frac{dy}{dx} = \frac{10}{\ln(5)} - \frac{2(6.25)+3}{2.5\ln^2(5)}$$

$$= 6.213 - \frac{15.5}{6.476}$$

$$= 6.213 - 2.393$$

$$= 3.82$$

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

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

$\dfrac{dy}{dx}$ at points $(2,-4)$ $x=2$ $y=-4$

$$\left.\frac{dy}{dx}\right|_{x=2,\,y=4} = \frac{-2(2^2+5)}{(2^2-5)}$$

$$= \frac{-2(4-5)}{4-5} = \frac{-2(9)}{-1} = 18$$

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

let $u = 2x^2+1$

$du = (2x^2+1)\ dx = 4x\,dx$

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

$\int x(2x^2+1)^{1/2}dx = \int \frac{\sqrt{u}}{4}du$

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

$= \frac{1}{4}\cdot\frac{u^{1/2+1}}{1/2+1} = \frac{\left(\frac{2u^{3/2}}{3}\right)}{4}$

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

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

$\therefore \int x\sqrt{2x^2+1}\,dx = \frac{1}{6}(2x^2+1)^{3/2}+C$

3 $z = 2x^3\ln y$

$\frac{dz}{dy} = \frac{6x^2}{y}$