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Math 104

1. $y = (2x^2+3)/\ln 2x$

$\ln y = \ln(2x^2+3) - \ln(\ln 2x)$

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

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

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

at $x = 2.5$

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

$= 9.63(0.63 - 0.25)$

$= 90.32$

2. $y = 2e^u/(x^2-5)^4$

$\frac{x\,du - u\,dv}{v^2}$

$\frac{dy}{dv} = \frac{(x^2-5)d(2u) - 2u\,d(x^2)}{(x^2-5)^2}$

$\frac{dy}{dx} = \frac{2e^u(x^2-5)(1) - 2x(2x)}{(x^2-5)^2}$

$\frac{-3x^2 - 10 - 4x^2}{(x^2-5)^2}$

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

at point $(2, -4)$

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

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

$= -12$

3. $Z = 2x^3 \ln y$

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