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19/ENG04/002

Electrical/Electronics.

1. $\frac{2x^2+3}{\ln 2x}$

Let $u = 2x^2+3$

$v = \ln 2x$

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

$\frac{dv}{dx} = \frac{2}{2x} = \frac{1}{x}$

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

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

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

at $x = 2.5$

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

$\frac{dy}{dx} = 16.09 - 6.2 = 3.82$

2.59

$dy/dx = 3.82$

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

Let $u = 2x$

$v = x^2 - 5$

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

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

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

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

$\frac{dy}{dx}_{\text{at } x=2} = \frac{-2(2)^2 - 10}{(2)^2 - 5)^2} = \frac{-18}{1}$

$m = \frac{dy}{dx} = -18$

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

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

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

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

4. $\int x\sqrt{2x^2+1}\,dx$

Let $u = 2x^2+1$

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

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

$= \int x\, u^{1/2}\, dx$

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

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

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

$\int x\sqrt{2x^2+1}\,dx = \frac{2(2x^2+1)^{3/2}}{12} = \frac{(2x^2+1)^{3/2}}{6}$