

Differentiate the following implicit function:

$$3y - x^2 + \ln xy = 2$$

$$3y' - 2x + \frac{1}{x} + \frac{y'}{y} = 0$$

$$y' \left(3 + \frac{1}{y} \right) = 2x - \frac{1}{x}$$

$$y' = \frac{2x - \frac{1}{x}}{\left(3 + \frac{1}{y} \right)}$$

Solve the following functions :

$$1. \int \frac{\ln(x^2)}{x} dx$$

Method I

$$u = \ln x^2 \quad du = \frac{2x}{x^2} dx = \frac{2}{x} dx$$

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

$$\frac{(\ln x^2)^2}{4} = \frac{(2 \ln x)^2}{4} = \frac{2^2 \ln x^2}{4}$$

$$= \ln x^2 + C$$

Method II

$$\int \frac{\ln(x^2)}{x} dx = \int \frac{2 \ln(x)}{x} dx$$

$$u = \ln x \quad du = \frac{1}{x} dx$$

$$2 \int u du = 2 \frac{u^2}{2} = u^2 = \ln x^2$$

$$= \ln x^2 + C$$

$$2. Dx((1 + 2x^2)^x) \quad [a^x = e^{x \ln a}]$$

$$Dx(e^{x \ln(1+2x^2)})$$

$$e^{x \ln(1+2x^2)} \left(1 * \ln(1 + 2x^2) + x * \frac{4x}{(1 + 2x^2)} \right)$$