

Lag Diff

①

$$y = x^2 (x^3 - 1)^5 e^{11}$$

Find $\frac{dy}{dx}$.

$$\ln(A) + \ln(B) = \ln(A \times B)$$

Soln: Taking \ln of b/s:

$$\ln(y) = \ln [x^2 (x^3 - 1)^5 e^{11}]$$

$$= \ln(x^2) + \ln(x^3 - 1)^5 + \ln(e^{11})$$

$$\ln(A^n) = n \ln(A)$$

$$\ln(y) = 2 \ln(x) + 5 \ln(x^3 - 1) + 11$$

Find $\frac{dy}{dx}$.

$$\frac{d}{dx} (\ln(y)) = \frac{d}{dx} [2 \ln(x) + 5 \ln(x^3 - 1) + 11]$$

$$\frac{1}{y} \frac{dy}{dx} = \frac{2}{x} + \frac{5}{x^3 - 1} \cdot (3x^2) + 0$$

$$\frac{dy}{dx} = y \left[\frac{2}{x} + \frac{15x^2}{x^3 - 1} + 0 \right]$$

$$= x^2 (x^3 - 1)^5 e^{11} \left[\frac{2}{x} + \frac{15x^2}{x^3 - 1} + 0 \right]$$

(2)

Let $y = x^x$ find $\frac{dy}{dx}$.

Soln: Take \ln of b/s:

$$\ln(y) = \ln(x^x) = x \ln(x)$$

$$\underline{\ln(A^n) = n \ln(A)}$$

$$\frac{d}{dx} (x \ln(x)) = 1 \cdot \ln(x) + x \cdot \frac{1}{x}$$

$$= \ln(x) + 1$$

Diff the LHS gives:

$$\frac{1}{y} \frac{dy}{dx} = \ln(x) + 1$$

$$\frac{dy}{dx} = y [\ln(x) + 1]$$

$$= x^x [\ln(x) + 1]$$

$$y = u^n$$

$$y = \frac{u \cdot v \cdot w}{z}$$

$$y = u^n v^m w^n$$