

Calculus

Successive Differentiation : Important Questions

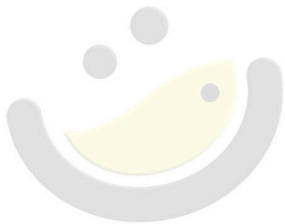
find the n^{th} derivative of

$$y = e^{3x} \sin^2 2x.$$

$$= e^{3x} \left(\frac{1 - \cos 4x}{2} \right)$$

$$\left[\begin{array}{l} \sin^2 \theta \\ = \frac{1 - \cos 2\theta}{2} \end{array} \right]$$

$$y = \frac{e^{3x}}{2} - \frac{1}{2} e^{3x} \cos 4x$$



$$y_n = \frac{1}{2} e^{3x} (3)^n - \frac{1}{2}$$

$$y = e^{ax} \cos(bx+c)$$

$$(9+16)^{n/2} e^{3x} \cos\left(4x+n + \tan^{-1} \frac{4}{3}\right)$$

$$y_n = (a^2+b^2)^{n/2} e^{ax}$$

$$\cos(bx+c+n + \tan^{-1} b/a)$$

$$y_n = \frac{1}{2} \left(e^{3x} (3)^n - (5)^n e^{3x} \cos\left(4x+n \tan^{-1} \frac{4}{3}\right) \right)$$

$$= \frac{1}{2} e^{3x} \left(3^n - 5^n \cos\left(4x+n \tan^{-1} \frac{4}{3}\right) \right) \underline{\underline{\text{Ans}}}$$

②

Leibnitz's Thm - Proof.

③

Prove that $\frac{d^n}{dx^n} \frac{\log x}{x} = \frac{(-1)^n n!}{x^{n+1}}$

$$\left(\log x - 1 - \frac{1}{2} - \frac{1}{2} - \dots - \frac{1}{n} \right)$$

$x > 0.$

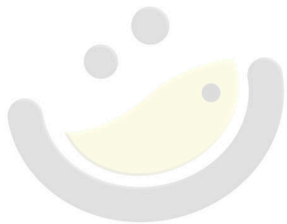
④

$y = (\sinh^{-1} x)^2$ Prove that

$$(1+x^2)y_{n+2} + (2n+1)xy_{n+1} + n^2y_n = 0$$

⑤

$$y = (\sin^{-1}x)^2 \quad \text{find } y_n(0)$$



OMG { MATHS }
The poetry of logical ideas.