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Dept: Elec- (Elec

Matric No: 19/Eg04/016

Math 104

$$1) \int 4 \sec^2(3m+1) dm$$

$$u = 3m + 1$$

$$du = 3 dm$$

$$dm = \frac{du}{3}$$

$$\int \frac{4 \sec^2 u du}{3}$$

$$\frac{4}{3} \int \sec^2 u du$$

Integration of $\sec^2 u$

$$= \tan u + C$$

$$\frac{4}{3} \tan u + C$$

$$\frac{4}{3} (\tan(3m+1)) + C$$

$$u^{1/2} - \frac{1}{2}$$

$$2) \int 2t \times (3t^2 - 1)^{\frac{1}{2}}$$

$$u = 3t^2 - 1$$

$$\frac{du}{6t} = \frac{6t}{6t} \cdot dt$$

$$dt = \frac{du}{6t}$$

$$\int 2t \times (u)^{\frac{1}{2}} \frac{du}{6t}$$

$$\int \frac{1}{3} \times u^{\frac{1}{2}} du$$

$$\frac{1}{3} \int u^{\frac{1}{2}} du$$

$$= \frac{1}{3} \times \frac{u^{\frac{1}{2}+1}}{\frac{1}{2}+1} + C$$

$$= \frac{1}{3} \times \frac{2}{3} u^{\frac{3}{2}} + C$$

$$= \frac{2}{9} u^{\frac{3}{2}} + C$$

$$\frac{2}{9} (3x^2 - 1)^{3/2} + C$$

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

$$u = 4x^2 - 1$$

$$du = 8x dx$$

$$dx = \frac{du}{8}$$

$$8x$$

$$= \int \frac{2x}{8} (u)^{-1/2} \frac{du}{8}$$

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

$$= \frac{1}{4} \times \frac{u^{-1/2 + 1}}{-1/2 + 1}$$

$$= \frac{1}{4} \times \frac{u^{1/2}}{1/2}$$

$$= \frac{1}{4} \times 2u^{1/2}$$

$$= \frac{1}{2} u^{1/2} = \frac{1}{2} (4x^2 - 1)^{1/2}$$

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

- Find the log of both sides

$$\log = \ln 3e^{2x} + \ln \sin 2x - \ln x^5$$

Differentiate w.r.t. x with respect to

$$\frac{d}{dx} (\log) = \frac{d}{dx} (\ln 3e^{2x}) + \frac{d}{dx} (\ln \sin 2x) - \frac{d}{dx} (\ln x^5)$$

$$= \frac{d}{dx} (\ln 3e^{2x})$$

$$= \frac{1}{3e^{2x}} \left(\frac{d}{dx} 3e^{2x} \right) + \frac{1}{\sin 2x} \left(\frac{d}{dx} \sin 2x \right) - \frac{1}{x^5} \left(\frac{d}{dx} x^5 \right)$$

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

multiply both sides with y

$$y \frac{dy}{dx} = y \left(\frac{2e^{2x}}{3e^{2x}} + \frac{2 \cos 2x}{\sin 2x} - \frac{5}{x} \right)$$

$$\frac{dy}{dx} = y \left(1 + \frac{2 \cos 2x}{\sin 2x} - \frac{5}{x} \right)$$