1

$y = \dfrac{3e^{x}\sin 2x}{x^{5/2}}$

find the Log of both Sides.

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

Differentiating in respect to

$\dfrac{d}{dx}(\ln y) = \dfrac{d}{dx}(3e^{x}) + \dfrac{d}{dx}(\ln \sin 2x) - \dfrac{d}{dx}(\ln x^{5/2})$

$\dfrac{1}{y}\dfrac{dy}{dx} = \dfrac{1}{3e^{x}}(3e^{x}) + \dfrac{1}{\sin 2x}(\cos 2x) - \dfrac{1}{x^{5/2}}\left(\tfrac{5}{2}x^{3/2}\right)$

$\dfrac{1}{y}\dfrac{dy}{dx} = \dfrac{3e^{x}}{3e^{x}} + \dfrac{\cos 2x}{\sin 2x} - \dfrac{\frac{5}{2}x^{5/2}}{x^{5/2}}$

Multiply both sides by y

$\dfrac{1}{y}\dfrac{dy}{dx} \times y = y\left[\dfrac{3e^{x}}{3e^{x}} + \dfrac{\cos 2x}{\sin 2x} - \dfrac{\frac{5}{2}x^{3/2}}{x^{5/2}}\right]$

$\dfrac{dy}{dx} = y\left(1 + \dfrac{\cos 2x}{\sin 2x} - \dfrac{\frac{5}{2}x^{3/2}}{x^{5/2}}\right]$

$\dfrac{dy}{dx} = \dfrac{3e^{x}\sin 2x}{x^{5/2}}\left[1 + \dfrac{\cos 2x}{\sin 2x} - \dfrac{\frac{5}{2}x^{3/2}}{x^{5/2}}\right]$

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1) $y = \left[(x+1)^2(x-2)^{1/2}\right] / \left[(2x-1)(x+3)^{3/2}\right]$

$$\ln y = \left[\ln(x+1)^2 + \ln(x-2)^{1/2}\right] - \left[\ln(2x-1) + \ln(x-3)^{3/2}\right]$$

$$\frac{1}{y} \cdot \frac{dy}{dx} = \left[\frac{1}{(x+1)^2}\, 2(x+1) + \frac{1}{(x-2)^{1/2}} \cdot \frac{(x-2)^{-1/2}}{2}\right] \cdot \left[\frac{1}{2x-1} \cdot 2 + \frac{1}{(x-3)^{3/2}} \cdot \frac{3(x-3)^{1/2}}{2}\right]$$

$$\frac{1}{y} \cdot \frac{dy}{dx} = \left[\frac{2(x+1)}{(x+1)^2} + \frac{(x-2)^{-1/2}}{2(x-2)^{1/2}}\right] - \left[\frac{2}{2x-1} + \frac{3(x-3)^{1/2}}{2(x-3)^{3/2}}\right]$$

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

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

$$\frac{dy}{dx} = \frac{(x+1)^2(x-2)^{1/2}}{(2x-1)(x-3)^{3/2}}\left[\frac{2}{x+1} + \frac{1}{2(x-2)} - \frac{2}{2x-1} - \frac{3}{2(x-3)^2}\right]$$

INTEGRATION

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

$$u = 3m+1$$

$$du = 3\,dm$$

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

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

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

Integration of $\sec^2 u$

$$= \tan u + c$$

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

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

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

$u = 3t^2 - 1$

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

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

$\int \cancel{2t} \times (u)^{1/2} \frac{du}{3}$

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

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

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

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

$= 2/9 \, u^{3/2} + c$

$= 2/9 \, (3t^2 - 1)^{3/2} + c$

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

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

$$du = 8x\,dx$$

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

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

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

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

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

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

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