Alagande Muthoheer Omolola
Electrical Electronics 19/ENG04/006
SERIAL NO ÷ 146
MATHS 104

①

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

$$\ln y = [2\ln(x+1) + \tfrac{1}{2}\ln(x-2)] - [\ln(2x-1) + \tfrac{3}{2}\ln(x+3)]$$

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

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

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

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

②

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

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

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

$$\frac{1}{y}\cdot\frac{dy}{dx} = 1 + \frac{2\cos 2x}{2\sin 2x} - \frac{5}{2x}$$

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

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

Scanned with CamScanner

Integration.

① $4\sec^2(3m+1)$

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

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

$U = 3m+1$

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

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

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

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

$\frac{4}{3}[\tan U] + C$

$\therefore \int 4\sec^2(3m+1)\,dm = \frac{4}{3}\tan(3m+1) + C$

② $2t(3t^2-1)^{1/2}$

$\int 2t(3t^2-1)^{1/2}\,dt$

$2\int t(3t^2-1)^{1/2}\,dt$

$U = (3t^2-1)^{1/2}$

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

$U^2+1 = 3t^2$

$t^2 = \frac{U^2+1}{3}$

$t = \left(\frac{u^2+1}{3}\right)^{1/2}$

$\frac{dt}{du} = \frac{1}{2}\left(\frac{u^2+1}{3}\right)^{-1/2} \cdot \frac{2u}{3}$

$\frac{dt}{du} = \frac{u}{3}\left(\frac{u^2+1}{3}\right)^{-1/2}$

$dt = \frac{U\,du}{3}\left(\frac{u^2+1}{3}\right)^{-1/2}$

$2\int \left(\frac{u^2+1}{3}\right)^{1/2} \cdot u \cdot \frac{u\,du}{3}\left(\frac{u^2+1}{3}\right)^{-1/2}$

Scanned with CamScanner

$$\frac{2}{3}\int\left(\frac{u^2+1}{3}\right)^{1/2-1/2}\cdot u^2\,du$$

$$\frac{2}{3}\left[\frac{u^3}{3}\right]+C$$

$$\therefore \int 2t(3t^2-1)^{1/2}\,dt = \frac{2(3t^2-1)^{3/2}}{3}+C$$

③ $$\frac{2x}{(4x^2-1)^{1/2}}$$

$$2\int\frac{x}{\sqrt{4x-1}}\,dx$$

$$u=\sqrt{4x^2-1}$$

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

$$u=\left(\frac{u^2+1}{4}\right)^{1/2}$$

$$\frac{dx}{du}=\frac{1}{2}\left(\frac{u^2+1}{4}\right)^{-1/2}\cdot\frac{u}{2}$$

$$du=\frac{u\,du}{4}\left(\frac{u^2+1}{4}\right)^{-1/2}$$

$$2\int\left(\frac{u^2+1}{4}\right)^{1/2}\cdot\frac{1}{u}\cdot\frac{u\,du}{4}\left(\frac{u^2+1}{4}\right)^{-1/2}$$

$$=\frac{\cancel{2}^{1}}{\cancel{4}_{2}}\int\left(\frac{u^2+1}{4}\right)^{1/2-1/2}\cdot\frac{1}{u}\,u\,du$$

$$=\frac{1}{2}\int du$$

$$=\frac{1}{2}[u]+C$$

$$\therefore \int\frac{2x}{(4x^2-1)^{1/2}}\,dx=\frac{\sqrt{4x^2-1}}{2}+C$$

Scanned with CamScanner