$$\frac{1}{3}\left[\frac{u^{3/2}}{3/2}+c\right]$$

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

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

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

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

$$\therefore \int\frac{2x}{(4x^2-1)^{1/2}}$$

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

let $u = 4x^2-1$

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

$$du = 8x\,dx \qquad \therefore dx = \frac{du}{8x}$$

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

$$\frac{2x}{8x}\int u^{-1/2}\cdot du$$

$$\frac{1}{4}\left[\frac{u^{1/2}}{1/2}\right]+c$$

$$\frac{1}{\cancel{4}\,2}\left[\cancel{2}\,u^{1/2}\right]+c$$

$$\frac{1}{2}(4x^2-1)^{1/2}+c$$

$$\frac{1}{2}(4x^2-1)^{1/2}+c$$

Integration

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

$\cancel{y} = \int 4\sec^2(3m+1)\,dm$

let $u = 3m+1$

$\frac{du}{dm} = 3$ ×

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

$\cancel{y} = \int 4\sec^2 u \; dm$

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

$4/3 \int \sec^2 u \cdot du$

Integral of $\sec^2 u = \tan u + C$

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

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

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

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

let $u = 3t^2 - 1$

$\frac{du}{dt} = 6t$ ×

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

$\cancel{y} = \int 2t\,(u)^{1/2}\,dt$

$\cancel{y} = \int 2t\,(u)^{1/2} \cdot \frac{du}{6t}$

$\frac{2\cancel{t}}{6\cancel{t}} \int u^{1/2} \cdot du$

$\frac{1}{3}\left[\frac{u^{1/2+1}}{1/2+1} + C\right]$

ILODIBE ANTHONY UDENNA

COMPUTER ENGINEERING

MAT 104

19/ENG02/026

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

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

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

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

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

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

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

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

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

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

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

$\dfrac{1}{y}\dfrac{dy}{dx} = 1 + 2\cot 2x - \dfrac{5}{2x^2}$

$\dfrac{dy}{dx} = y\left[1 + 2\cot 2x - \dfrac{5}{2x^2}\right]$

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