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MAT 104 Assignment

Department: Computer Engineering

Matric No: 19/EN6021004

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

$$u = 3m+1$$

$$du = 3 dm$$

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

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

$$4/3 \tan u + C$$

$$\text{Ans: } 4/3 \tan(3m+1) + C //$$

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

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

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

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

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

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

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

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

$$\text{Ans} = \frac{2}{9} (3t^2 - 1)^{3/2} + C$$

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

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

$$du = 8x dx$$

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

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

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

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

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

B

$$1. \quad y = \frac{3e^x \sin 2x}{x^{5/2}}$$

Find the log of both sides

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

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

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

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

1 Continued

Multiply both sides by y

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

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

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

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

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

$$\frac{1}{y} \cdot \frac{dy}{dx} = \frac{2}{x+1} + \frac{1}{2x-4} - \frac{2}{2x-1} - \frac{3\sqrt{x+3}}{2\sqrt{(x+3)^3}}$$

$$\frac{dy}{dx} = \frac{(x+1)^2 (x-2)^{1/2}}{(2x-1)(x+3)^{3/2}} \left(\frac{2}{x+1} + \frac{1}{2x-4} - \frac{2}{2x-1} - \frac{3}{2(x+3)} \right)$$