

Khechukwu Jude Chikwunonso

Elect/Elect Engr.

S/N: 147.

MATH 104 Assignment

Question 1

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

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

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

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

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

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

Question 2

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

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

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

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

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

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

Tude

Integrate the following with respect to the variable.

Q:1

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

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

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

$$u = 3m+1$$

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

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

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

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

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

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

Q:2

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

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

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

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

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

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

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

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

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

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

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

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

Tude.

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

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

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

Q 3:

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

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

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

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

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

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

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

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

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

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

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

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