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Department: Computer Engineering

Matric No: 19/Eng 02/036

Course: Mat 104

01)  $\int x^{1/2} \ln x \, dx$

$$\int \ln(x) \times x^{1/2} \, dx$$

Use partial integration formula

$$\int u \, dv = uv - \int v \, du \quad \text{where } u = \ln(x)$$

$$dv = x^{1/2}$$

$$du = 1/x$$

$$v = 2\sqrt{x}$$

$$\int u \, dv = \ln(x) \times \frac{2\sqrt{x}}{2} - \int \frac{2\sqrt{x}}{2} \times \frac{1}{x} \, dx$$

$$= \ln x \times \frac{2\sqrt{x}}{2} - \int \frac{2\sqrt{x}}{2}$$

$$\ln x \times \frac{2\sqrt{x}}{2} - \frac{2}{2} \int x^{1/2} \, dx$$

$$= \ln x \times \frac{2\sqrt{x}}{2} - \frac{2}{2} \times \frac{2\sqrt{x}}{2}$$

$$\frac{2\sqrt{x} \times \ln x}{2} - \frac{4\sqrt{x}}{4}$$

$$= \frac{2\sqrt{x} \times \ln x}{2} - \frac{4\sqrt{x}}{4} + C //$$

02)  $\int 2 \cos 6t \cos t \, dt$

$$\cos A \cos B = \frac{1}{2} [\cos(A+B) + \cos(A-B)]$$

$$= 2 \int \cos 6t \cos t \, dt$$

$$dv = x^{-2}$$

$$du = \frac{1}{x}$$

$$u = 2\sqrt{x}$$

$$\int u dv = \ln(x) \times \frac{2\sqrt{x}}{3} - \int \frac{2\sqrt{x}}{3} \times \frac{1}{x} dx$$

$$= \ln x \times \frac{2\sqrt{x}}{3} - \int \frac{2\sqrt{x}}{3}$$

$$\ln x \times \frac{2\sqrt{x}}{3} - \frac{2}{3} \int x^{1/2} dx$$

$$= \ln x \times \frac{2\sqrt{x}}{3} - \frac{2}{3} \times \frac{2\sqrt{x}}{3}$$

$$\frac{2\sqrt{x} \times \ln x}{3} - \frac{4\sqrt{x}}{9}$$

$$= \frac{2\sqrt{x} \times \ln x}{3} - \frac{4\sqrt{x}}{9} + C$$

$$02) \int 2 \cos 6t \cos t dt$$

$$\cos A \cos B = \frac{1}{2} [\cos(A+B) + \cos(A-B)]$$

$$= 2 \int \cos 6t \cos t$$

$$= \frac{1}{2} [\cos(6t+t) + \cos(6t-t)]$$

$$= \frac{1}{2} \cos 7t + \cos 5t$$

$$= 2 \int \frac{1}{2} \cos 7t + \cos 5t$$

$$= \frac{2}{2} \int \cos 7t + \cos 5t$$

$$= \frac{\sin 7t}{7} + \frac{\sin 5t}{5} + C //$$

03)  $\int \sin^3 x \cos^4 x dx$

$$u = \cos x$$

$$\frac{du}{dx} = -\sin x \Rightarrow dx = \frac{-du}{\sin x}$$

$$\sin^2 x + \cos^2 x = 1$$

$$\sin^2 x = 1 - \cos^2 x$$

$$= \int \sin x \cdot \sin^2 x \cdot \cos^4 x \cdot \frac{-du}{\sin x}$$

$$\neq \int \sin^2 x \cdot \cos^4 x \cdot -du$$

$$= - \int \sin^2 x \cdot u^4 du$$

$$= - \int (1 - \cos^2 x) \cdot u^4 du$$

$$= - \int (1 - u^2) \cdot u^4 du$$

$$= - \int (u^2 - 1) u^4 du$$

$$= \int (u^6 - u^4) du$$

$$= \left[ \frac{u^7}{7} - \frac{u^5}{5} \right] + C$$

$$= \left[ \frac{\cos^7 x}{7} - \frac{\cos^5 x}{5} \right] + C //$$

$$= \frac{(\cos^7 x)}{7} - \frac{(\cos^5 x)}{5} + C //$$

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$$dv = x^{1/2}$$

$$du = \frac{1}{x}$$

$$v = 2\sqrt{x}$$

$$\int u \, dv = \ln(x) x \frac{2\sqrt{x}}{3} - \int \frac{2\sqrt{x}}{3} x \frac{1}{x} \, dx$$

$$= \ln x \times \frac{2x\sqrt{x}}{3} - \int \frac{2\sqrt{x}}{3}$$

$$\ln x \times \frac{2x\sqrt{x}}{3} - \frac{2}{3} \int x^{1/2} \, dx$$

$$= \ln x \times \frac{2x\sqrt{x}}{3} - \frac{2}{3} x \frac{2\sqrt{x}}{3}$$

$$\frac{2x\sqrt{x} \times \ln x}{3} - \frac{4x\sqrt{x}}{9}$$

$$= \frac{2x\sqrt{x} \times \ln x}{3} - \frac{4x\sqrt{x}}{9} + C$$

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$$= \frac{1}{2} [\cos(6t+t) + \cos(6t-t)]$$

$$= \frac{1}{2} \cos 7t + \cos 5t$$

$$= 2 \int \frac{1}{2} \cos 7t + \cos 5t$$