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Course: MATH04

Assignment

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

$$u = \ln x \quad dv = x^{1/2}$$

$$\frac{du}{dx} = \frac{1}{x} \quad v = x^{3/2}$$

$$du = \frac{dx}{x} \quad v = \frac{2x^{3/2}}{3}$$

$$\int u \, dv = uv - \int v \, du$$

$$= \ln x \cdot \frac{2x^{3/2}}{3} - \int \frac{2x^{3/2}}{3} \cdot \frac{dx}{x}$$

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

$$= \frac{2x^{3/2} \ln x}{3} - \frac{2}{3} \left[\frac{x^{3/2}}{3/2} \right] + C$$

$$= \frac{2x^{3/2} \ln x}{3} - \frac{2}{3} \left[\frac{2x^{3/2}}{3} \right] + C$$

$$= \frac{2x^{3/2} \ln x}{3} - \frac{4x^{3/2}}{9} + C$$

$$= \frac{2x^{3/2} \ln x}{3} - \frac{4x^{3/2}}{9} + C$$

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

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

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

$$\int \cos 7t + \cos 5t$$

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

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

$$u = \cos x$$

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

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

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

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

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

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

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

$$\int u^6 - u^4 du$$

$$= \frac{u^7}{7} - \frac{u^5}{5} + C$$

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