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MAT 104 ASSIGNMENT

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✓ Civil Engineering
✓ 19/ENG03/005
✓ MAT 104 Assignment

① $\int x^{1/2} \ln x \, dx$

Let $v = \ln x$, $du = x^{1/2} dx$

$dv = \frac{dx}{x}$; $u = \frac{2x^{3/2}}{3}$

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

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

$\int \frac{2x^{3/2}}{3} \cdot \frac{dx}{x} \Rightarrow \int \frac{2x^{1/2}}{3} \cdot dx$

$\int \frac{2x^{1/2} dx}{3} = \frac{4x^{3/2}}{9} + C$

$\therefore \int x^{1/2} \ln x \, dx = \frac{2x^{3/2} \ln x}{3} - \frac{4x^{3/2}}{9} + C$

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

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

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

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

$\therefore \int 2\cos 6t \cos t = \frac{\sin 7t}{7} + \frac{\sin 5t}{5} + C$

③ $\int \sin^3 x \cos^4 x \, dx$

since m is odd, $u = \cos x$

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

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

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

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

$$\int \sin^3 x \cos^4 x \, dx = \int \sin x \cdot \sin^2 x \cdot u^4 \cdot \frac{-du}{\sin x}$$

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

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

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

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

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

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