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19/ENG04/052 Elect/Elect Engineering MAT104

1 $\int \sqrt{x} \ln(x)\, dx = \int \ln(x) \sqrt{x}\, dx$

$u = \ln(x)$, $dv = \sqrt{x}\,dx$

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

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

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

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

$= \frac{2}{3} x^{2/3} \ln(x) - \frac{2}{3} \cdot \frac{2}{3} x^{3/2} + C$

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

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

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

$= 2 \int \cos \underset{A}{6t} \cos \underset{B}{t} \, dt \qquad \cos A \cos B = \frac{1}{2} (\cos(A+B) + \cos (A-B))$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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