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COURSE: MAT 104
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ASSIGNMENT

1) $\int x^{\frac{1}{2}} \ln x$

$u = \ln x \qquad dv = x^{\frac{1}{2}}$

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

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

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

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

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

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

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

$A = 6t, \quad B = 1t$

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

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

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

$2\int \cos 6t \cos t\, dt = 2 \cdot \frac{1}{2}\int (\cos 7t + \cos 5t)$

$= 1\left[\frac{\sin 7t}{7} + \frac{\sin 5t}{5}\right] + C$

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

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

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

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

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

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

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

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

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

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