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18/ENG02/006
Computer Engineering
Mat 104

(1) $x^{1/2}\ln x$

$\int x^{1/2}\ln x$

$y = x^{1/2}$ $du = \ln x$

$\frac{dy}{dx} = \frac{1}{2}x^{-1/2}$

$\int \frac{v\,du}{dx} + \int \frac{u\,dv}{dx}$

$\ln x \int \frac{dx^{1/2}}{dx} + x^{-1/2}\int \frac{d\ln x}{dx}$

$\ln x\left(\frac{x^{3/2}}{3/2}\right) + x^{1/2}\left[\frac{1}{x^2}\right] + c$

$\frac{2\ln x}{3} \cdot x^{3/2} + \frac{x^{1/2}}{x} + c$

$\frac{2x^{3/2}\ln x}{3} + \frac{\sqrt{x}}{x} + c$

2. $\int 2\int \cos 6t \cos 4t = 12\int \cos 6t \cos 4t\, dt$

$A = 6t$ $B = 4t$

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

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

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

$\int 2\cos 6t \cos 4t = \frac{1}{2}\int (2\cos 7t + \cos 5t)$

$= \left[\frac{\sin 7t}{7} - \frac{\sin 5t}{5}\right]$

$= \frac{\sin 7t}{7} - \frac{\sin 5t}{5} + c$

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

$u = \cos x$

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

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

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

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

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

Recall

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

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

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

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

but $u = \cos x$

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

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

$= \left[\frac{u^{4+1}}{4+1} - \frac{u^{6+1}}{6+1}\right] + c$

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

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