UMDREN QUEEN FREDRICK 19/MHS01/422

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

$= x^2(-\cos x) - \int(-\cos x)2x\,dx$

$= -\cos x \cdot x^2 + \int \cos x\, 2x\,dx$ — ①

from $\int \cos x\, 2x\,dx$

$u = 2x \quad , dv = \cos x$

$du = 2dx \quad v = \sin x$

$\int u\,dv = uv - \int v\,du \Rightarrow 2x\sin x - \int \sin x\, 2dx$ — ②

Substitute equation 2 into equation ①

$= -x^2\cos x + 2x\sin x - 2\int \sin x\,dx$

$= -x^2\cos x + 2x\sin x - 2(-\cos x) + C$

$= -x^2\cos x + 2x\sin x + 2\cos x + C$

4. $\int \cos 5x \cos 6x$

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

$\int \cos 5x \cos 6x = \frac{1}{2}[\cos(5x+6x) + \cos(5x-6x)]$

$\int \cos 5x \cos 6x = \frac{1}{2}[\cos 11x + \cos(-x)] = \frac{1}{2}[\sin 11x/11 + \sin -x/-1]$

$= \frac{\sin 11x}{22} + \frac{(\sin -x)}{2} + C$

5. $\int \sin 7x \cos 2x$

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

$\int \sin 7x \cos 2x = \frac{1}{2}[\sin(7x+2x) + \sin(7x-2x)]$

$= \frac{1}{2}[\sin 9x + \sin 5x]$

$= \frac{1}{2}[-\cos 9x/9 - \cos 5x/5]$

$\int \sin 7x \cos 2x = \frac{-\cos 9x}{18} - \frac{\cos 5x}{10} + C$

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1. $\int 2x^2 \ln x \, dx$

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

$u = \ln x$, $dv = 2x^2$

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

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

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

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

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

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

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

2. $\int 3t e^{2t} dt$

$u = 3t$, $dv = e^{2t}$

$du = 3dt$, $v = \frac{1}{2}(e^{2t})$

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

$= 3t \left(\frac{e^{2t}}{2}\right) - \int \frac{e^{2t}}{2} \cdot 3dt$

$= \frac{3}{2} t e^{2t} - \frac{3}{2} \int e^{2t} dt$

$= \frac{3}{2} t e^{2t} - \frac{3}{2} \cdot \frac{e^{2t}}{2} + C$

$= \frac{3}{2} t e^{2t} - \frac{3e^{2t}}{4} + C$

3. $\int x^2 \sin x \, dx$

$u = x^2$, $dv = \sin x$

$du = 2x dx$, $v = -\cos x$