OHIOMOBA BRITELLO IJEOMA

MBBS

19/MHS01/303

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

$A = 5x \quad , \quad B = 6x$

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

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

$= \frac{1}{2}\left[\cos 11x + \cos(-x)\right] dx$

$= \frac{1}{2}\left[\cos 11x - \cos x\right] dx$

$= \frac{1}{2}\left[\frac{-\sin 11x}{11} - \left(\frac{-\sin x}{1}\right)\right] dx$

$= \frac{1}{2}\left[\frac{-\sin 11x}{11} + \frac{\sin x}{1}\right]$

$= \frac{-\sin 11x}{22} + \frac{\sin x}{1} + C$

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

$A = 7x \quad , \quad B = 2x$

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

$= \frac{1}{2}\left[\sin(7x+2x) + \sin(7x-2x)\right] dx$

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

$= \frac{1}{2}\left[-\cos 9x + (-\cos 5x)\right]$

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

$= \frac{-\cos 9x}{18} - \frac{\cos 5x}{10}$

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Interesting, I did

2.) $\int 3te^{2t}\,dt$

Let $u = 3t$, $\frac{dv}{dt} = e^{2t}$

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

Using the formular, $\int u\,dv = uv - \int v\,du$

$$\int 3te^{2t}dt = \left[3t \cdot \tfrac{1}{2}e^{2t} - \int \tfrac{1}{2}e^{2t} \cdot 3\right]dx$$

$$\int 3te^{2t}dt = \left[\frac{3te^{2t}}{2} - \frac{1}{4}e^{2t} \cdot 3\right]dx$$

$$\int 3te^{2t}dt = \left[\frac{3te^{2t}}{2} - \frac{3}{4}e^{2t}\right]dx$$

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

3.) $\int x^2 \sin x$

Let $u = x^2$, $\frac{dv}{dx} = \sin x$

$\frac{du}{dx} = 2x$, $v = \int \sin x = -\cos x$

Using the formular; $\int u\,dv = uv - \int v\,du$

$$\int x^2 \sin x\,dx = \left[x^2 \cdot -\cos x - \int -\cos x \cdot 2x\right]dx$$

$$\int x^2 \sin x\,dx = \left[-x^2\cos x - \int -2x\cos x\right]dx$$

$\int x$ Using integration by parts; $u = x$, $\frac{dv}{dx} = \cos x$

$\frac{du}{dx} = 1$, $v = \int \cos x = \sin x$

$$\int x^2 \sin x\,dx = \left[-x^2\cos x + 2\int x\cos x\right]dx$$

$$\int x^2 \sin x\,dx = \left[\left(-x^2\cos x + 2(x\sin x + \cos x)\right)\right]dx$$

$$\int x^2 \sin x\,dx = \left[\left(-x^2\cos x + 2x\sin x + 2\cos x\right)\right]dx$$

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

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

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

Let $u = \ln x$, $\frac{dv}{dx} = 2x^2$

$\frac{du}{dx} = \frac{1}{x}$, $v = \int 2x^2 = \frac{x^3}{3}$

$\Rightarrow \int 2x^2 \ln x \, dx = 2\int x^2 \ln x \, dx$

Using the formular, $\int u\,dv = uv - \int v\,du$

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

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

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

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

$= 2\left(\frac{x^3 \ln x}{3} - \frac{x^3}{9}\right) dx$

$= \frac{2x^3 \ln x}{3} - \frac{2x^3}{9} dx$

$= \frac{3 \times 2x^3 \ln x - 2x^3}{9} dx.$

$= \frac{2x^3(3\ln x - 1)}{9} + c$

$= \frac{2x^3(\ln x - 1)}{3} + c$

$\therefore \int 2x^2 \ln x = \frac{2x^3(\ln x - 1)}{3} + c$