ADELEKE BLESSING OLUWAKEMI.

MHS/MBBS.

19/MHS01/030

5 $\sin 7x \cos 2x$

$\int \sin 7x \cos 2x\, dx$

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

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

$= \frac{1}{2}[\sin[7x+2x] + \sin[7x-2x]]$

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

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

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

4 $\cos 5x \cos 6x$

$\int \cos 5x \cos 6x\, dx$

$A = 5x \quad B = 2x$

Using

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

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

$= \frac{1}{2}[\cos 7x + \cos 3x]\, dx$

$$= \frac{1}{2}\left[\frac{\sin 7x}{7} + \frac{\sin 3x}{3}\right]$$

$$= \frac{\sin 7x}{14} + \frac{\sin 3x}{6}$$

3. $x^2 \sin x$

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

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

$\frac{du}{dx} = 2x$

$v = -\cos x$

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

recall ; $\int u \frac{dv}{dx} dx = uv - \int v \frac{du}{dx} dx$

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

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

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

$\int x \cos x \, dx$

let $u = x$; $\frac{dv}{dx} = \cos x$

$\frac{du}{dx} = 1$ $\quad v = \sin x$

$= x \sin x - \int \sin x \, dx$

$= x \sin x + \cos x$

$= -x^2 \cos x + 2[x \sin x + \cos x] + c$

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

2 $3te^{2t}$

$\int 3te^{2t}$

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

$\frac{dy}{dt} = 3 \quad v = \frac{1}{2}e^{2t}$

$du = 3dt$

using

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

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

$= \frac{3t}{2}e^{2t} - \frac{1}{2} \cdot \frac{1}{2}3e^{2t}$

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

$= \left[\frac{3}{2}te^{2t} - \frac{3}{4}e^{2t}\right] + c$

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① $2x^2 \ln x$

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

$\cancel{u = 2x^2}$ / $\cancel{dv = \ln x}$

$\cancel{\frac{du}{dx} = 4x}$ / $\cancel{v =}$

$u = \ln x \qquad dv = 2x^2 dx$

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

$du = 1/x \, dx$

using

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

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

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

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

$= \ln x \cdot \frac{2}{3} x^3 - \frac{2x^3}{9} + c$

$= \frac{2}{3} x^3 [\ln x - 1/3] + c$