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19/mhs01/279

Mbbs

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ASSIGNMENT

1) $2x^2 \ln x$

let $u = \ln x$ $\quad du = 1/x \, dx$

$v = 2/3 x^3$

$du = \ln x$

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

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

$= \int 2x^2 \ln x = 2/3 x^3 \ln x - 2/3 \int x^2 dx$

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

2) $3te^{2t}$

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

$du = 3dx$ $\quad v = 1/2 e^{2t}$

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

$\int 3te^{2t} = 3t \cdot 1/2 e^{2t} - \int 1/2 e^{2t} \cdot 3dx$

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

$\int 3te^{2t} = \frac{3}{2} te^{2t} - \frac{3}{2} e^{2t} \cdot \frac{1}{2} + C$

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

3) $x^2 \sin x$

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

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

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

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

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

$= -x^2 \cos x + \left[\begin{matrix} u = 2x & dv = \cos x \\ du = 2dx & v = \sin x \end{matrix} \right]$

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

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

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

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

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

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

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

$= \frac{1}{2}[\cos 11x + \cos x]$

$\int \cos 5x \cos 6x = \frac{1}{2}\left[\frac{\sin 11x}{11} + \sin x\right] + C$

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

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

$A = 7x, B = 2x \quad 7 + 2 = 9 \quad 7 - 2 = 5$

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

$\int \sin 7x \cos 2x \, dx = \frac{1}{2}\left[\frac{1}{2} \sin 7x + \sin 5x\right.$

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

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