Assignment

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19/MHS01/062
Medicine? Surgery
MHS

1. Integrate $2x^2 \ln x dx$

Solution:

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

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

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

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

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

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

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

2. $\int 3te^{2t} dx$

Solution.

$$\int 3te^{2t} dt$$

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

$\frac{du}{dt} = 3 \qquad v = e^{2t}$

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

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

$$= 3te^{2t} - e^{3t}$$

$= \cancel{3te^{3t}}$

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

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③ $\int x^2 \sin x$

Solution

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

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

$\frac{du}{dx} = 2x \qquad v = \cos x$

$= \sin x \times \int x^2 dx$

$= \sin x \times \frac{x^3}{3}$

$= \sin x \times \frac{x^3}{3} + c$

$= \frac{x^3 \sin x}{3} + c$

④ $\int \cos 5x \cos 6x \, dx$

Solution

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

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

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

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

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

$= \frac{\cos 11x}{22} + \frac{\cos x}{2} + c$

⑤ $\int \sin 7x \cos 2x$

Solution

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

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

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

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$$= \frac{1}{2}\left(\sin 9x + \sin 5x\right)$$

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

$$= \frac{\sin 9x}{18} + \frac{\sin 5x}{10} + C$$

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