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Course Code: MAT 104

Assignment

Integrate the following functions:

1. $2x^2 \ln x$

Solt

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

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

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

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

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

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

$\int 2x^2 \ln x \, dx = \frac{2x^3}{3} \ln x - \frac{2}{3} \times \frac{x^{3^1}}{3} + c$

$\int 2x^2 \ln x \, dx = \frac{2x^3}{3} \ln x - \frac{2x^3}{9} + C$

2. $3te^{2t}$

Solt

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

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

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

c $du = 3dt$

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

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

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

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

3 $x^2 \sin x$

3 & 1t

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

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

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

$du = 2x\,dx$

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

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

$\int x \cos x\,dx$

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

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

$du = dx$

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

$\int x \cos x\, dx = x \sin x - (-\cos x) + c$

$\int x \cos x\, dx = x \sin x + \cos x + c$

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

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

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

Solt

$\cos 5x \cos 6x$

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

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

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

$\int \cos 5x \cos 6x\, dx = \frac{1}{2}\int \cos 11x - \cos x\, dx$

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

$\int \cos 5x \cos 6x\, dx = \frac{\sin 11x}{22} - \frac{\sin x}{2} + c$

5 $\sin 7x \cos 2x$

$A = 7, \quad B = 2$

$$\sin 7x \cos 2x = \frac{1}{2}[\sin 9x + \sin 5x]$$

$$\int \sin 7x \cos 2x \, dx = \frac{1}{2}\int \sin 9x + \sin 5x \, dx$$

$$\int \sin 7x \cos 2x \, dx = \frac{1}{2}\left(\frac{-1}{9}\cos 9x \; \frac{-1}{5}\cos 5x\right) + C$$

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

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