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MAT 104

Assignment

Find the integral of the following

1. $e^x \sin x \, dx$

Solution

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

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

$u = \sin x \quad du = \cos x$

$dv = e^x \quad v = e^x$

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

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

$u = \cos x \quad du = -\sin x$

$dv = e^x \quad v = e^x$

$= e^x \sin x - (e^x \cos x + \int e^x \sin x)$

Let $I = \int e^x \sin x \, dx$

$I = e^x \sin x - e^x \cos x - I$

$I = \frac{e^x \sin x - e^x \cos x}{2}$

$\int e^x \sin x \, dx = \frac{1}{2}[e^x \sin x - e^x \cos x] + C$

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

Solution

~~$\int e^x \sin x \, dx$~~ $\int 2x^2 \ln x \, dx$

$u = \ln x \quad du = \frac{1}{x}$

$dv = 2x^2 \quad v = \frac{2x^3}{3}$

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

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

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

3. $x^2 \sin x \, dx$

Solution

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

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

$u = x^2 \qquad du = 2x$

$dv = \sin x \qquad v = -\cos x$

$= x^2 \cdot -\cos x - \int -\cos x \cdot 2x$

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

$= -x^2 \cos x + \quad u = 2x \qquad du = 2$

$dv = \cos x \qquad v = \sin x$

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

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

4. $x \cos x \, dx$

Solution.

$\int x \cos x \, dx$

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

$u = x, \qquad du = 1$

$dv = \cos x \qquad v = \sin x$

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

$= x \sin x + \cos x + C$