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MATHS 104
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AGRICULTURAL ENGINEERING
15/ENG09/004

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

$u = e^x$, $du = e^x dx$

$v = -\cos x$ $dv = \sin x\,dx$

$\Rightarrow -e^x \cos x + \int \cos x\, e^x dx$

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

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

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

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

$\int e^x \sin x\,dx = \frac{1}{2}(e^x \sin x - e^x \cos x) + c$

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

$u = \ln x$, $du = \frac{1}{x}dx$

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

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

$\Rightarrow \frac{2x^3}{3}\ln x - \int \frac{2x^2}{3}dx \Rightarrow \frac{2x^3}{3}\ln x - \frac{2x^3}{9} + c$

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

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

$u = x^2 \quad du = 2x \, dx$

$v = -\cos x, \quad dv = \sin x \, dx$

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

$\Rightarrow -x^2 \cos x + \left[2x \sin x - \int \sin x \times 2 \, dx \right]$

$\rightarrow -x^2 \cos x + \left[2x \sin x - \int 2 \sin x \, dx \right]$

$\Rightarrow -x^2 \cos x + 2x \sin x + 2 \cos x + c$

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

4 $\int x \cos x \, dx$

$u = x, \quad du = dx$

$v = \sin x, \quad dv = \cos x \, dx$

$x \sin x - \int \cos x + c$

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