Collins Sarima Lennenda
19/SCI01/034
Computer science

Find the integral of the following

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

soln

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

$du/dx = \cos x \quad v = e^x$

$du = \cos x \, dx$

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

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

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

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

$du/dx = -\sin x \quad v = e^x$

$du = -\sin x \, dx$

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

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

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

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

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

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

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

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

soln

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

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

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

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

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

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

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

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

$$= \frac{2x^3(3\ln x - 1)}{9} + c$$

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

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

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

$du = 2x\,dx$

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

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

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

$u = 2x$ $\quad dv = \cos x$

$du/dx = 2$ $\quad v = \sin x$

$du = 2\,dx$

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

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

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

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

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

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

$du/dx = 1$ $\quad v = \sin x$

$du = dx$

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

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

$= x \sin x + \cos x + c$