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DEPARTMENT: COMPUTER SCIENCE

MATRIC NO: 19/SCI01/004

ASSIGNMENT

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~~Assignment~~

1.) $\int e^{x} \sin x \, dx$

Soln.

$u = \sin x$ $\qquad$ $dv = e^{x}$

$du = \cos x \, dx$ $\qquad$ $v = e^{x}$

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

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

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

$\int e^{x} \cos \, dx$

$u = \cos x$ $\qquad$ $dv = e^{x}$

$du = -\sin x \, dx$ $\qquad$ $v = e^{x}$

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

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

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

$$\int e^{x} \sin x \, dx = e^{x} \sin x - \left[e^{x} \cos x + \int e^{x} \sin x \, dx \right]$$

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

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

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

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

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

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

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

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

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

Solu:

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

$u = \ln x$ $\quad v = x^3/3$

$du = 1/x \, dx$

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

$$= 2\left[\ln(x) \times \frac{x^3}{3} - \int \frac{x^3}{3} \times \frac{1}{x} \, dx\right]$$

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

$$= 2\left[\frac{x^3 \ln(x)}{3} - \frac{1}{3}\int x^2 \, dx\right]$$

$$= 2\left[\frac{x^3 \ln(x)}{3} - \frac{1}{3} \times \frac{x^3}{3}\right]$$

$$= 2\left[\frac{x^3 \ln(x)}{3} - \frac{x^3}{9}\right]$$

$$\therefore \int 2x^2 \ln x \, dx = \left[\frac{2}{3} x^3 \left(\frac{\ln(x)}{1} - \frac{1}{3}\right)\right] + C$$

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

Solu.

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

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

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

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

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

$\int 2x \cos x \, dx$

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

$du = 2\,dx$ $\quad v = \sin x$.

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

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

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

$= 2x\sin x - 2(-\cos x)$

$= 2x\sin x + 2\cos x$

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

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

Sol:

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

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

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

$= x\sin x - \int \sin x \times 1 \, dx$

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

$= x\sin x - (-\cos x) + C$

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