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

$$= \frac{2x^3}{3}\left[\ln x - \frac{2}{3}\right] + C$$

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

Soln

using Integration by parts.
$\int u\,dv = uv - \int v\,du$

let $u = x^2$ | $\int dv = \int \sin x \, dx$
$du = dx$ | $v = -\cos x$

$\therefore uv - \int v\,du$

$(x)^2(-\cos x) - \int(-\cos x)(dx)$

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

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

4] $x \cos x \, dx$

using Integration by pa[rts]
$\int u\,dv = uv - \int v\,du$

Soln

let $u = x$ | $\int dv = \int \cos x \, dx$
$du = dx$ | $v = \sin x$

$\therefore uv - \int v\,du$

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

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

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

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ASSIGNMENT MAT 104

Find the Integral of the Following

Soln

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

Using Integration by Parts.

$\int u \frac{dv}{dx}\,dx = uv - \int v \frac{du}{dx}\,dx$.

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

Let $u = e^x$ and $\frac{dv}{dx} = \sin x$

$\frac{du}{dx} = e^x$ $v = -\cos x$

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

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

We have to find the Integral of $\int e^x \cos x\,dx$.

Let $u = e^x$ and $\frac{dv}{dx} = \cos x$

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

$v = +\sin x$

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

$= e^x \sin x - \int e^x \sin x$

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

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

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

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

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

Soln

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

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