NWOKORIE PASCAL CHIMAMDI
MECHATRONICS ENGINEERING
19/ENG05/048

1) $x^2 \sin x \, dx$.

$\int x^2 \sin x$ let $u = x^2$ . and $dv = \sin x$,

$\frac{du}{dx} = 2x$ . $\frac{dv}{dx}$ $v = -\cos x$.

Using $uv - \int v du$

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

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

let $u = -2x$ . and $dv = \cos x$

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

$(-2x)(\sin x) - \int (\sin x)(-2)$

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

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

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

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

2) $3te^{2t}$

let $u = 3t$ $dv = e^{2t}$

$\frac{du}{dt} = 3$ $v = \frac{1}{2} e^{2t}$

Using $uv - \int v du$

$(3t)(e^{2t}/2) - \int (e^{2t}/2)(3\,dt)$

$= \frac{3}{2} t e^{2t} - \int \frac{3e^{2t}}{2} dt = \frac{3te^{2t}}{2} - \frac{3}{2}\int e^{2t}$

$= \frac{3te^{2t}}{2} - \frac{3}{2}\left(\frac{1}{2} e^{2t}\right) + c$

$= \left[\frac{3te^{2t}}{2} - \frac{3}{4} e^{2t}\right] + c$

5) $2x^2 \ln x \, dx$

let $u = 2x^2$ and $dv = \ln x$

$\frac{du}{dx} = 4x$ $\quad V = 1/x$

$\therefore du = 4x \, dx$

Using $uv - \int v \, du$

$= (2x^2)(1/x) - \int (1/x)(4x)$

$= \frac{2x^2}{x} - \int \frac{4x}{x}$

$= 2x - 4 + C$

4) $\frac{(2x - 3x^2)}{(1-x)} dx$

$= \cancel{1-x}$

$$\begin{array}{r|l} & 2x - x^2 \\ 1 - x & 2x - 3x^2 \\ & -2x + 2x^2 \\ & -x^2 \\ & -x^2 + x^3 \\ & +x^3 \end{array}$$

Which can now be

$\int (2x - x^2) \, dx + \int \frac{x^3}{1-x} \, dx$

$= \left( \frac{2x^2}{2} - \frac{x^3}{3} \right) + \cancel{3} \cancel{4x} \left( \frac{x^4}{4} \ln(1-x) \right) + C$

$\left[ x^2 - \frac{x^3}{3} + \frac{x^4}{4} \ln(1-x) \right] + C$