SHINKE WILLIAMS GWAHEMEN
19/ENG05/059
MECHATRONICS

1. $\int x^2 \sin(x)\,dx \Rightarrow I = \int u\,dv = uv - \int v\,du$

Let $u = x^2$ $dv = \sin(x)\,dx$

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

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

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

$u = x$ $dv = \cos(x)\,dx$

$du = 1\,dx$ $v = \sin(x)$

$I = -x^2\cos x + 2[x\sin(x) - \int \sin(x)\,dx]$

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

2. $3te^{2t}\,dt$

$\int 3te^{2t}\,dt$

$= \int 3t \cdot \int e^{2t}\,dt$

$= \frac{3t^2}{2} \cdot \frac{1}{2}e^{2t} + C$

$= \frac{3t^2}{4e^{2t}} + C$

$= \frac{3t}{4e^2} + \frac{C}{1}$

3. $\int 2x^2 \ln x$

$= \int 2x^2 \cdot \int \ln x + c$

$\int \frac{2x^3}{3} \Rightarrow \frac{2x^3}{3} \cdot \frac{1}{x} + c$

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

4. $\int \frac{2x - 3x^2}{1-x}$

$= \int \frac{x(2-3x)}{1-x}$

$1-x \;\big|\; 2x-3x^2 \;\big|\; 2x$

$2x - 2x^2$

x^2

$= \int 2x + \int \frac{x^2}{1-x}$

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

$= x^2 + x^2 \ln(1-x)$