Ogenyi Emmanuella On
19/ENG04/039
MAT 104

1.) $3te^{2t}$

Solution

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

$\frac{du}{dt} = 3$ $\int dv = \int e^{2t}$

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

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

$= 3t\left(\frac{e^{2t}}{2}\right) - \int \frac{e^{3t}}{2} \times 3dt$

$= 3t\left(\frac{e^{2t}}{2}\right) - \frac{1}{2}\int 3e^{2t}\,dt$

$= 3t\left[\frac{e^{2t}}{2}\right] - \frac{1}{2} \times \frac{3e^{2t}}{2} + c$

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

2.) $\int x^2 \sin x$

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

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

Using $uv - \int v\,du$

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

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

$\left\{\begin{array}{l}\text{let } u = 2x \text{ and } dv = \cos x \\ du/dx = -2x \text{ and } v = \sin x\end{array}\right\}$

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

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

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

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

$\therefore 3x^2\sin x = -x^2\cos x - 2x\sin x - 2\cos x + c_1$