MAT104

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Assignment

1. $3te^{2t}$

Soln

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

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

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

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

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

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

$3t\left(\frac{e^{2t}}{2}\right) - \frac{1}{2} \times \frac{3e^{2t}}{2} + C$

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

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

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

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

using $uv - \int v\,du$

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

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

[Let $u = -2x$ and $dv = \cos x$
$du/dx = -2x$ and $v = \sin x$]

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

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

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

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

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

3. $\int \sin 7x \cos 2x$

let $A = 7x$, $B = 2x$

$\int \sin 7x \cos 2x = \frac{1}{2}(\sin(7x + 2x) + \sin(7x -$

$\int \sin 7x \cos 2x = \frac{1}{2}[\sin 9x + \sin 5x)$

$= \frac{1}{2}\int\left[\frac{\sin 9x}{9} + \frac{\sin 5x}{5}\right]$

$= \frac{\cos 9x}{18} - \cos 5x + C$

4) $2x - 3x^2$

$1 - x \,\overline{)\, 2x - 3x^2}$ quotient $2x - x^2$

$-\ 2x - 2x^2$

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

$1 - x \,\overline{)\, 2x - 3x^2}$ quotient $2x - x^2$

$-\ 2x - 2x^2$

$-x^2$

$-\ -x^2 + x^3$

$-x^3$

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

$= \frac{2x^2}{2} - \frac{x^3}{3} + x^3\ln(1-x)$