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

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

$\sin 7x \cos 2x = \frac{1}{2}\left[\sin(7x+2x) + \sin(7x-2x)\right]$

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

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

$= -\frac{\cos 9x}{18} - \frac{\cos 5x}{10} + C$

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

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

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

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

using $uv - \int v du$

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

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

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

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

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

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

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

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

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16/ENG04/003
Computer Engineering

1) $3te^{2t}$

Solution

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

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

$\frac{du}{dt} = 3$

$du = 3dt$

$v = \frac{e^{2t}}{2}$

Using $uv - \int vdu = \int udv$

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

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

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

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

$$= -\frac{\cos 9x}{18} - \frac{\cos 5x}{10} + C$$

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

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

which can now be

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