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Electrical Electronics Engineering
Maths 104
S/N 204

$3te^{2t}$

Let $u = 3t$ and $du = e^{2t}$

$du/dt = 3$ $\quad \int du = \int e^{2t}$

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

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

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

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

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

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

2 $\int x^2 \sin x$

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

$du/dx = 2x$ 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 $du = \cos x$.

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

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

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

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

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

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

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

Let $A = 7x$ and $B = 2x$

Using $\frac{1}{2}[\sin A+B] + \sin(A-B)]$

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

$\frac{1}{2}(\sin 9x + \sin 5x)$

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

$$\frac{1}{2}\left[\frac{-\cos 9x}{9} \quad \frac{-\cos 5x}{5}\right]$$

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

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

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

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

which can now be

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

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