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MATRIC NO.: 19/ENG04/015 SERIAL NO: 19
MAT104 ASSIGNMENT:

Integrate the followings

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

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

$u = 3t \quad dv = e^{2t}dt$

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

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

$= \frac{3t.e^{2t}}{2} - \int \frac{e^{2t}}{2} . 3\,dt$

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

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

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

$\int x^2 \sin x\,dx$; $u = x^2 \quad dv = \sin x\,dx$

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

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

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

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

$\int 2x\cos x\,dx$;

$u = 2x \quad dv = \cos x\,dx$

$du = 2dx \quad v = \sin x$

$\int u.dv = u.v - \int v.du$

$= 2x\sin x - \int 2\sin x\,dx$

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

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

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

(3.) $\sin 7x\cos 2x$

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

$A = 7x, \; B = 2x$

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

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

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

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

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

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

Let $u = 1 - x$ $\quad du/dx = 1$

Substituting, $u = 1-x$ ; $\int \frac{(u+1)\,(3(u+1) - 2)}{u}$

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

$$= \int \frac{-3x^2 + 2x}{1-x}$$

$$\begin{array}{r|l} & 3x + 1 \\ \hline -x+1 & -3x^2 + 2x \\ & -(-3x^2 + 3x) \\ \hline & 0 \quad -x \\ & -(-x + 1) \\ \hline & 0 \quad R - 1 \end{array} \quad = 3x + 1 - \frac{1}{1-x}$$

∴ Dividing polynomially; $\int \left[3x + 1 - \frac{1}{1-x}\right] dx$

$$= \frac{3x^{1+1}}{1+1} + \frac{x^{0+1}}{0+1} - \int \frac{1}{1-x}$$

$\int \frac{1}{1-x}$ Let $u = 1-x$ $\quad du/dx = -1$

$$\int -\frac{du}{u} = -\ln u = -\ln|1-x|$$

$$\therefore \int \frac{2x - 3x^2}{1-x}\,dx = \frac{3x^2}{2} + x + \ln|1-x| + c$$