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DEPARTMENT: CIVIL ENGINEERING

MATRIC NUMBER: 19/ENG03/005

MAT 104 ASSIGNMENT

✓ Alonigenni Treasure, Agbenu-owo
✓ Civil Engineering
✓ 19/ENG03/005
✓ MAT 104 Assignment

① $3te^{2t}$

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

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

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

$du = 3dt$

$$\therefore uv - \int v\,du$$

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

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

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

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

② $x^2 \sin x$

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

$u = x^2 \qquad dv = \sin x$

$\dfrac{du}{dx} = 2x \qquad v = -\cos x$

$du = 2x\,dx$

$$\therefore uv - \int v\,du$$

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

$$x^2 \cos x + \int \cos x \cdot 2x\, dx$$

$$\begin{cases} u = 2x & dv = \cos x \\ \dfrac{du}{dx} = 2 & v = \sin x \\[4pt] du = 2dx \\ 2x\sin x - 2\int \sin x\, dx \\ 2x\sin x - 2(-\cos x) \\ 2x\sin x + 2\cos x \end{cases}$$

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

③ $\int \sin 7x \cos 2x\, dx$, $A = 7x$, $B = 2x$

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

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

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

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

$$\int \sin 7x \cos 2x\, dx = \frac{-\cos 9x}{18} - \frac{\cos 5x}{10} + C$$

4. $\int \dfrac{(2x - 3x^2)}{1-x}$;

$$\begin{array}{r} 3x + 1 \\ 1-x\,\overline{\smash{\big)}\,2x - 3x^2} \\ \underline{-3x - 3x^2} \\ -x \\ \underline{+1-x} \\ 1 \end{array}$$

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