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Department : Computer Engineering Course : MAT 104 Session No : 3

Assignment

1) $3te^{2t}$

Let $U = 3t$ and $dU = e^{2t}$

$$\frac{dU}{dt} = 3 \quad dV = e^{2t}$$

$$dU = 3dt$$

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

Using $UV - \int V du - \int u dv$

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

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

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

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

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

Let $U = x^2$ and $dU = 2x dx$

$$\frac{dU}{dx} = 2x \text{ and } V = -\cos x$$

using $uv - \int v du$

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

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

$$\left[\text{Let } U = 2x \text{ and } dU = (\cos x) \right]$$

$$\left[\frac{dU}{dx} = -2x \text{ and } U = \sin x \right]$$

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

$$\text{Continuation of 2}$$
$$-2x \sin 2x - (-2) \int \sin 2x \, dx$$

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

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

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

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

$$\text{Let } A = 7x, B = 2x$$

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

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

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

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

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

$$1-x$$

$$2x - x^2$$

$$1-x \sqrt{2x - 3x^2}$$

$$= -2x - \frac{2x^2}{x^2}$$

$$-\frac{x^2 + 3x^3}{x^3}$$

which can now be

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

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