

SN: 36

19/ENG06/062

Mechanical Zachary Daniel Ayobii MAT104
 Integrate the following with respect
 to their variable.

1 $3te^{2t}$

2 $x^2 \sin x$

3 $\sin 7x \cos 2x$

4 $(2x - 3x^2) / (1-x)$

① Solution
 $\int 3te^{2t}$

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

$$du = 3 \quad v = \frac{1}{2}e^{2t}$$

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

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

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

② $x^2 \sin x$

$$u = x^2$$

$$du = 2x$$

$$dv = \sin x$$

$$v = -\cos x$$

$$\begin{aligned} \int u dv &= uv - \int v du \\ &= -x^2 \cos x - \int -2x \cos x \\ &= -x^2 \cos x + 2x \sin x \end{aligned}$$

$$3 \quad \sin 7x \cos 2x$$

$A = 7x \quad B = 2x$

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

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

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

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

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

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

$$4 \quad (2x - 3x^2) / (1-x)$$

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

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

Let $t = 1-x$

$$\int \frac{2t}{t} - \int \frac{2t}{t}$$

$$\int 2 dt - \int \frac{2 dt}{t}$$

$$2t - 2 \ln(t)$$

$$2 - 2x - 2 \ln(1-x)$$

$$\int \frac{3x^2}{1-x} dx \quad t = 1-x$$

$$\int 3 = \frac{6t}{6} + \frac{3t^2}{6}$$

$$\int \frac{3}{6} - \frac{6t}{6} + \frac{3t^2}{6} dt$$

$$\int 3 \ln(t) - 6 + 3t$$

$$\int \frac{3}{6} - 6 + 3t dt$$

$$\int 3 \ln(t) - 6t + \frac{3t^2}{2}$$

$$3 \ln(1-x) - 6(1-x) + \frac{3(1-x)^2}{2}$$

$$3 \ln(1-x) - 6 + 6x + \frac{3 - 6x + 3x^2}{2}$$

$$3 \ln(1-x) - \frac{6 + 6x}{1} + \frac{3 - 6x + 3x^2}{2}$$

$$3 \ln(1-x) + \frac{-12 + 12x + 3 - 6x + 3x^2}{2}$$

$$\frac{-9 + 6x + 3x^2 + 3 \ln(1-x)}{2}$$

$$\frac{2 - 2x - 2 \ln(1-x) - 9 + 6x + 3x^2 + 3 \ln(1-x)}{2}$$

$$\frac{4x - 4x - 9 + 6x + 3x^2 + \ln(1-x)}{2}$$

$$\frac{-5 + 2x + 3x^2 + \ln(1-x)}{2}$$