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Assignment

1-) $\int x \sin x dx$

Soln

Let $u = x$ $dv = \sin x$
 $du/dx = 1$ $v = -\cos x$

$$\begin{aligned} \int u dv &= uv - \int v du \\ &= (x)(-\cos x) - \int -\cos x (1) \\ &= -x \cos x + \int \cos x dx \\ &= -x \cos x + (\sin x) + C \end{aligned}$$

2-) $\int 3t e^{2t} dt$

Soln

Let $u = 3t$ $dv = e^{2t} dt$
 $du/dt = 3$ $v = \frac{1}{2} e^{2t}$

$$\begin{aligned} \int u dv &= uv - \int v du \\ &= \frac{e^{2t} 3t}{2} - \int \frac{1}{2} e^{2t} (3) \\ &= \frac{e^{2t} 3t}{2} - \frac{3 \times 1}{2 \times 2} e^{2t} + C \\ &= 3 \left(\frac{t e^{2t}}{2} - \frac{e^{2t}}{4} \right) + C \end{aligned}$$

3-) $\int 2x^2 \ln x dx$

Soln

Let $u = \ln x$ $dv = 2x^2$
 $du/dx = \frac{1}{x} dx$ $v = \frac{2x^3}{3}$

$$\begin{aligned}
 \int u dv &= uv - \int v du \\
 &= \ln x \left(\frac{2x^3}{3} \right) - \int \frac{2x^3}{3} \left(\frac{dx}{x} \right) \\
 &= \frac{2x^3 \ln x}{3} - \int \frac{2x^2}{3} dx \\
 &= \frac{2x^3 \ln x}{3} - \frac{2x^3}{9} + C
 \end{aligned}$$

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

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

$$\begin{aligned}
 \therefore \int u dv &= (3x+1) dx + \int \frac{-1}{(1-x)} dx \\
 &= \frac{3x^2}{2} + x + \ln(1-x) + C //
 \end{aligned}$$