BILIAMEEN ADEDOLAPO ABDULFATTAH
MECHATRONICS ENGINEERING
19/ENG05/019
DR OYELAMI

1 $x^2 \sin x \, dx$

Solution

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

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

$du = 2x\,dx$

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

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

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

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

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

Solution

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

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

$du = 3dt$

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

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

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

3 $\int 2x^2 \ln x \, dx$

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

$\frac{du}{dx} = \frac{1}{x} \qquad v = \frac{2x^3}{3}$

$du = \frac{1}{x} dx$

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

$= \ln x \cdot \frac{2x^3}{3} - \int \frac{2x^3}{3} \cdot \frac{1}{x} dx$

$= \frac{2x^3}{3} \ln x - \int \frac{2x^2}{3} dx$

$\frac{2x^3}{3} \ln x - \frac{2x^3}{9} + C$

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

$3x + 1$

$(1-x) \overline{)\ 3x^2 + 2x}$

$-3x^2 + 3x$

$-x + 0$

$-x + 1$

-1

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

$\int 3x + 1 + \frac{1}{1-x} dx$

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

$u = 1 - x$

$du = -1 dx \qquad dx = -1 du$

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

$\frac{3x^2}{2} + x + \int \frac{1}{u} du$

$\frac{3x^2}{2} + x + \ln c$

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