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DEPT: INDUSTRIAL CHEMISTRY MATRIC NO: 19/SCI09/003

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

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

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

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

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

$= -x^2 \cos x - \int -2x \cos x$

$u = -2x \qquad dv = \cos x$

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

$\int u\,dv = (-2x \sin x) - \int (\sin x)(-2\,dx)$

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

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

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

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

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

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

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

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

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

$u = \ln x, \quad dv = 2x^2$

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

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

$\int 2x^2 \ln x = (\ln x)(\frac{2x^3}{3}) - \int (\frac{2x^3}{3})(\frac{1}{x}\,dx)$

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

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

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

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

$-3x^2 + 3x$

$-x$

$-x + 1$

$-1$

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

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