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MATRIC NO: 19/MHS01/079

COURSE: MATH 104

DEPT: MBBS; 100L

1 $\int 2x^2 \ln x$

$$u = \ln x$$

$$dv = 2x^2$$

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

$$v = \frac{2x^3}{3}$$

$$\text{So } \int u dv = uv - \int v du$$

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

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

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

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

2 $\int 3t e^{2t}$

$$u = 3t$$

$$dv = e^{2t}$$

$$du = 3 dt$$

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

$$\text{So } \int u dv = uv - \int v du$$
$$\int 3t e^{2t} = 3t \cdot \frac{1}{2} e^{2t} - \int \frac{1}{2} e^{2t} \cdot 3 dt$$

$$\int 3t e^{2t} = \frac{3t}{2} \cdot e^{2t} - \frac{1}{2} \cdot 3 e^{2t} + C$$

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

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$$x^2 \sin x$$

$$u = x^2$$

$$\frac{du}{dx} = 2x$$

$$dx$$

$$dv = \sin x$$

$$v = -\cos x$$

$$du = 2x dx$$

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

$$\int x^2 \sin x dx = x^2 \cdot -\cos x - \int -\cos x \cdot 2x dx$$

$$\int x^2 \sin x dx = -x^2 \cos x + \int 2x \cos x dx$$

$$\int x^2 \sin x dx = -x^2 \cos x + \left[\begin{array}{l} u = 2x \quad dv = \cos x \\ du = 2 dx \quad v = \sin x \end{array} \right]$$

$$\int x^2 \sin x dx = -x^2 \cos x + uv - \int v du$$

$$\int x^2 \sin x dx = -x^2 \cos x + 2x \sin x - \int \sin x \cdot 2 dx$$

$$\int x^2 \sin x dx = -x^2 \cos x + 2x \sin x - \int 2 \sin x$$

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

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$$4 \quad \cos 5x \cos 6x$$

$$A = 5x, \quad B = 6x$$

Recall that $\cos A \cos B = \frac{1}{2} [\cos(A+B) + \cos(A-B)]$

$$\frac{1}{2} [\cos 11x + \cos x]$$

$$\int \cos 5x \cos 6x \, dx = \frac{1}{2} \left[\frac{\sin 11x}{11} + \sin x \right] + C$$

$$\therefore \int \cos 5x \cos 6x \, dx = \frac{\sin 11x}{22} + \frac{\sin x}{2} + C$$

$$6 \quad \sin 7x \cos 2x$$

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

Recall that $\sin A \cos B = \frac{1}{2} [\sin(A+B) + \sin(A-B)]$

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

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$$\int \sin 7x \cos 2x dx = \frac{1}{2} \left[\frac{-\cos 9x}{9} - \frac{\cos 5x}{5} \right] + C$$

$$\int \sin 7x \cos 2x dx = \frac{-\cos 9x}{18} - \frac{\cos 5x}{10} + C$$