

# MA1104 ASSIGNMENT FOR MBBS

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MEDICINE AND SURGERY

MA1104

Integrate the following functions

1.  $2x^2 \ln x$

Let  $u = \ln x$ ,  $du = \frac{1}{x} dx$

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

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

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

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

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

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

2.  $3te^{2t}$

Let  $u = 3t$ ,  $du = 3 dt$

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

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

$\int 3te^{2t} = 3t \cdot \frac{1}{2}e^{2t} - \int \frac{1}{2}e^{2t} \cdot 3 dt$

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

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

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

$$3) x^2 \sin x$$

$$u = x^2, \quad du = 2x dx$$

$$dv = \sin x, \quad v = -\cos x$$

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

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

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

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

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

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

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

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

$$= -x^2 \cos x + 2x \sin x - 2(-\cos x)$$

...

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

$$4) \cos 5x \cos 6x$$

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

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

$$\cos 5x \cos 6x = \frac{1}{2} [\cos(5x+6x) + \cos(5x-6x)]$$

$$= \frac{1}{2} (\cos 11x + \cos(-x))$$

$$\int \left( \frac{1}{2} \cos 11x + \frac{1}{2} \cos x \right) dx$$

$$= \frac{1}{2} \int (\cos 11x + \cos x) dx$$

$$= \frac{1}{2} \int \cos 11x dx + \int \cos x dx$$

$$= \frac{1}{2} \left( \frac{\sin 11x}{11} + \sin x \right) + C$$

$$= \frac{1}{22} \sin 11x + \frac{1}{2} \sin x + C$$

$$\therefore \int \cos 5x \cos 6x = \frac{1}{22} \sin 11x + \frac{1}{2} \sin x + C$$

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

$$5. \sin 7x \cos 2x$$

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

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

$$\sin 7x \cos 2x = \frac{1}{2} [\sin(7x+2x) + \sin(7x-2x)]$$

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

$$\sin 7x \cos 2x = \frac{1}{2} \int \sin 9x dx + \int \sin 5x dx$$

$$\sin 7x \cos 2x = \frac{1}{2} \left( -\frac{1}{9} \cos 9x + \frac{-1}{5} \cos 5x \right)$$

$$\int \sin 7x \cos 2x = -\frac{1}{18} \cos 9x - \frac{1}{10} \cos 5x + C$$

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