

UMWELA JOANNA IBEOJO

MBBS

MATH 104

MATRIC NO: 19/MH201/418

1 $\int 2x^2 \ln x \, dx$
let $u = \ln x$ and $dv = 2x^2$

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

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

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

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

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

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

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

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

2 $3t e^{2t}$

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

let $u = 3t$ $dv = e^{2t}$

$$du = 3 \, dt$$

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

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

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

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

3 $x^2 \sin x$

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

$du = 2x$ $v = -\cos x$

dx

$du = 2x dx$

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

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

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

$$= -x^2 \cos x + \int u = 2x \quad dv = \cos x$$

$$du = 2 dx \quad v = \sin x$$

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

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

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

4 $\cos 5x \cos 6x$

Let $A = 5x$ and $B = 6x$

Recall

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

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

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

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

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

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

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

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

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

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