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MEDICINE & SURGERY

1) $2x^2 \ln x$

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

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

$$\int u dv = \ln x \times \frac{2x^3}{3} - \int \frac{2x^3}{3} \times \frac{1}{x}$$

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

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

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

$$2x^2 \ln x = \frac{2x^3}{3} \left[\ln x - \frac{1}{3} \right] + C$$

2) $3te^{2t}$

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

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

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

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

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

$$= \frac{3e^{2t}}{2} \left[t - \frac{1}{2} \right] + C$$

$$3. x^2 \sin x$$

Formula

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

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

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

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

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

$$-x^2 \cos$$

$$\int x^2 \sin x = -x^2 \cos x + \left[2x \sin x - \int \sin x \times 2 \right]$$

$$\int x^2 \sin x = -x^2 \cos x + \left[2x \sin x - \int 2 \sin x \right]$$

$$\int x^2 \sin x = -x^2 \cos x + \left[2x \sin x - (-2 \cos x) \right]$$

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

$$= \cos x \left[\frac{-x^2}{\cos x} + 2 \right] \text{ divide through by } \cos x \quad 2 \cos x$$

$$= \frac{-x^2 \cos x}{2 \cos x} + \frac{2x \sin x}{2 \cos x} + \frac{2 \cos x}{2 \cos x}$$

$$\frac{-x^2}{2} + x \tan x + 1 + c$$

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④ $\cos 5x \cos 6x$ when $A=5x, B=6x$

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

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

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

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

⑤ $\sin 7x \cos 2x$

⑥ $\sin A \cos B = \frac{1}{2} [\sin(A+B) + \sin(A-B)]$

when $A=7x, B=2x$

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

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

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

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

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