

АВЕБАҢҠА-ОҖО ПАТӨСІМА ОҚАМИС

19/MHSD1/023

MEDICINE AND SURGERY

MATHS

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

$u = \ln x$

$du = 1/x$

$dv = 2x^2$

$v = 2x^3/3$

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

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

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

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

2. $\int 3te^{2t}$

$u = 3t$

$du = 3$

$dv = e^{2t}$

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

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

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

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

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

$$\approx \frac{2(3te^{2t}) - 3e^{2t}}{4}$$

$$\approx \frac{6te^{2t} - 3e^{2t}}{4}$$

$$\int 3te^{2t} = e^{2t} \frac{(6t-3)}{4} + C$$

3. $x^2 \sin x$

$$u = x^2$$

$$du = 2x dx$$

$$dv = \sin x$$

$$v = -\cos x$$

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

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

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

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

$$\int 2x \cos x$$

$$u = 2x$$

$$du = 2 dx$$

$$dv = \cos x$$

$$v = \sin x$$

$$= 2x \sin x - \int 2 \sin x$$

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

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

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

$$4. \int \cos 5x \cos 6x$$

Since

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

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

$$\begin{aligned} \cos 5x \cos 6x &= \frac{1}{2}(\cos(6x+5x) + \cos(6x-5x)) \\ &= \frac{1}{2}(\cos(11x) + \cos x) \end{aligned}$$

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

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

$$= \frac{1}{2} \left[\frac{\sin 11x}{11} + \frac{\sin x}{1} \right]$$

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

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

Since

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

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

$$\begin{aligned} \sin A \cos B &= \frac{1}{2}(\sin(7x+2x) + \sin(7x-2x)) \\ &= \frac{1}{2}(\sin 9x/9 + \sin 5x/5) \end{aligned}$$

$$= \frac{\sin 9x}{18} + \frac{\sin 5x}{10} + C$$