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(1) $\int 2x^2 \ln(x)\,dx$

Let $u = \ln x$, $dv = 2x^2$

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

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

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

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

$= \frac{2x^3}{3} \ln(x) - \frac{2}{3} \cdot \frac{x^3}{3}$

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

b) $\int 3te^{2t}\,dt$

$u = 3t$ $\qquad$ $dV = e^{2t}$

$\frac{du}{dx} = 3$ $\qquad$ $V = \frac{1}{2}e^{2t}$

$du = 3dx$

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

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

(c) $\int$ ...

(E) $\int x^2 \sin x \, dx$

let $u = x^2$, $dv = \sin x$

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

$v = -\cos x$

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

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

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

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

* $\int \cos 5x \cos 6x$

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

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

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

$\int \cos 5x \cos 6x = \frac{1}{2}\int(\cos 11x - \cos x)$

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

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

e) $\int \sin 7x \cos 2x$

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

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

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

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

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

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

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