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

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

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

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

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

$\ln x \; \frac{2}{3}x^3 - \frac{2}{3}\int\left(\frac{x^2}{3}\right) + C$

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

$\int 3te^{2t}$

$u = 3t \qquad du = 3dt$

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

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

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

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

$\frac{3}{2}te^{2t} - \left(\frac{1}{2} \times \frac{3}{2}e^{2t}\right)$

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

$\int x^2 \sin x \, dx$

$u = x^2 \quad du = 2x\,dx$
$dv = \sin x \quad v = -\cos x$
$uv - \int v\,du$
$x^2 - \cos x - \int -\cos x \; 2x\,dx$

$u = 2x \quad du = 2$
$dv = -\cos x \quad v = \sin x$
$-x^2 \cos x - [uv - \int u\,dv]$
$-x^2 \cos x - [2x \sin x - \int 2 \sin x]$
$-x^2 \cos x - 2x \sin x - 2(-\cos x) + C$
$-x^2 \cos x - 2x \sin x + 2\cos x + C$

$\cos 5x \cos 6x$
$\cos A \cos B = \frac{1}{2}[\cos(A+B) + \cos(A-B)]$
$\cos 5x \cos 6x = \frac{1}{2}[\cos(5x+6x) + \cos(5x-6x)]$
$= \frac{1}{2}[\cos(11x) + \cos(-x)]$
$\int \cos 5x \cos 6x\,dx = \int \frac{1}{2}[\cos(11x) + \cos(-x)]\,dx$
$= \frac{1}{2}\int \cos(11x) + \cos(-x)\,dx$
$= \frac{1}{2}\left[-\sin(11x)\cdot\frac{1}{11} + \sin(-x)\frac{-1}{-1}\right.$
$= \left[\frac{-\sin 11x}{22} + \frac{\sin x}{+2}\right] + C$
$\int \cos 5x \cos 6x\,dx = \frac{\sin 11x}{22} + \frac{\sin x}{2} + C$

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

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

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

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

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

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

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

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

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