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

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

$= -x^2\cos x - -2x \cdot \sin x - \int \sin x - 2$ [let $v = -2x$, $dv = \cos x\,dx$, $dx = -2$, $y = \sin x$

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

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

4 $\cos 5x \cos 6x = \frac{1}{2}\cos(5x+6x) + \cos(5x-6x)$

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

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

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

$= \frac{\cos 11x}{22} - \frac{\cos x}{4} + c$

5 $\sin 7x \cos 2x\,dx = \frac{1}{2}[\sin(A+B) + \sin(A-B)$

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

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

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

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

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

let $u = \ln x$ $\quad du = 1/x$

$dv = 2x^2 dx$ $\quad v = 2/3 x^3$

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

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

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

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

$= \frac{2x^3}{3} \ln x - \frac{2x^3}{4}$

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

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

let $u = 3t$ $\quad du = 3$

$dv = e^{2t} dx$ $\quad v = 1/2 e^{2t}$

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

$= 3t \times 1/2 e^{2t} - \int 1/2 e^{2t} \times 3$

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

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

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

3 $\int x^2 \sin x$, $u = x^2$ $\quad dx = 2x$

$dv = \sin x dx$ $\quad v = -\cos x$

$= uv - \int v \, du$

$= -\cos x - \int -\cos x \times 2x \, dx$