8. $\int (x^2 \cos 3x)\,dx$

S	D	I
+ →	x^2	$\cos 3x$
− →	$2x$	$\frac{1}{3}\sin 3x$
+ →	2	$-\frac{1}{9}\cos 3x$
−	0	$-\frac{1}{27}\sin 3x$

$\int \cos \frac{3x}{u}\,dx$

$u = 3x \quad du = 3\,dx$

$\frac{1}{3}\int \cos 3x \cdot 3\,dx$

$\frac{1}{3}\int \cos u\,du$

$\frac{1}{3}\sin u$

$\frac{1}{3}\sin 3x$

$= x^2\left(\frac{1}{3}\sin 3x\right) - 2x\left(-\frac{1}{9}\cos 3x\right) + 2\left(-\frac{1}{27}\sin 3x\right) + C$

$= \boxed{\frac{1}{3}x^2\sin 3x + \frac{2}{9}x\cos 3x - \frac{2}{27}\sin 3x + C}$

9. $\int_0^1 (x^2 e^{-4x})\,dx$

S	D	I
+ →	x^2	e^{-4x}
− →	$2x$	$-\frac{1}{4}e^{-4x}$
+ →	2	$\frac{1}{16}e^{-4x}$
−	0	$-\frac{1}{64}e^{-4x}$

$\int e^{-4x}\,dx$

$u = -4x \quad du = -4\,dx$

$-\frac{1}{4}\int e^{-4x}\cdot(-4)\,dx$

$-\frac{1}{4}\int e^u\,du$

$-\frac{1}{4}e^u$

$-\frac{1}{4}e^{-4x}$

$\left[x^2\left(-\frac{1}{4}e^{-4x}\right) - 2x\left(\frac{1}{16}e^{-4x}\right) + 2\left(-\frac{1}{64}e^{-4x}\right)\right]_0^1$

$\left[e^{-4x}\left(-\frac{1}{4}x^2 - \frac{1}{8}x - \frac{1}{32}\right)\right]_0^1$

$-\frac{1}{32}\left[e^{-4x}\left(8x^2 + 4x + 1\right)\right]_0^1$

$-\frac{1}{32}\left[e^{-4(1)}\left(8\cdot 1^2 + 4\cdot 1 + 1\right) - e^{-4(0)}\left(8\cdot 0^2 + 4\cdot 0 + 1\right)\right]$

$= -\frac{1}{32}\left[e^{-4}(8+4+1) - 1(1)\right]$

$= -\frac{1}{32}\left[e^{-4}(13) - 1\right]$

$= -\frac{1}{32}\left[\frac{13}{e^4} - 1\right]$

$= -\frac{1}{32}\left[\frac{13}{e^4} - \frac{e^4}{e^4}\right]$

$-\frac{1}{32}\left[\frac{13 - e^4}{e^4}\right]$

$\boxed{\frac{e^4 - 13}{32e^4}}$