1. $\int_0^{\frac{\pi}{2}} x^2 \sin x \, dx$ $u = x^2$ $v = -\cos x$

$du = 2x\,dx$ $dv = \sin x\,dx$

$= x^2 x - \cos x \Big|_0^{\frac{\pi}{2}} - \int_0^{\frac{\pi}{2}} -\cos x \, 2x \, dx$, $u = 2x$ $v = \sin x$

$= 0 - \left(2x \times \sin x \Big|_0^{\frac{\pi}{2}} - \int_0^{\frac{\pi}{2}} \sin x \, 2 \, dx\right)$ $du = 2\,dx$ $dv = -\cos x\,dx$

$= \pi + 2\cos x \Big|_0^{\frac{\pi}{2}}$

$= \pi - 2$

2. $\int x^3 \ln(x)\,dx$ $u = \ln(x)$ $v = \frac{1}{4}x^4$

$du = \frac{1}{x}dx$ $dv = x^3 dx$

$= \ln(x)\frac{1}{4}x^4 - \int \frac{x^4}{4} \times \frac{1}{x}\,dx$

$= \ln(x)\frac{1}{4}x^4 - \frac{1}{4}\int x^3 dx$

$= \ln(x)\frac{1}{4}x^4 - \frac{1}{16}x^4 + C$