① $\int x\sin x\,dx$ (u, v', $v=-\cos x$) $= -x\cos x + \int \cos x\,dx$

can evaluate $\int u'v\,dx$ $= -x\cos x + \sin x + c$.

② $\int e^x \sin 2x\,dx := I$ (u', v)

$= e^x \sin 2x - 2\int e^x \cos 2x\,dx$ (y', z)

$= e^x \sin 2x - 2\left[e^x \cos 2x + 2\int e^x \sin 2x\,dx\right]$

$5\int e^x \sin 2x\,dx = e^x(\sin 2x - 2\cos 2x) + c$.

$\int e^x \sin 2x\,dx = \frac{e^x}{5}(\sin 2x - 2\cos 2x) + c'$.

③ $\int x(\ln x)^2\,dx$ (v', u) Pick $v = x$

$= \frac{(\ln x)^2 x^2}{2} - \int \frac{x^2}{2}\left(\frac{2\ln x}{x}\right)dx$

$= \frac{(x\ln x)^2}{2} - \int \underbrace{x\ln x}_{u}\,dx$ (v')

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

$= \frac{(x\ln x)^2 - x^2\ln x + \frac{x^2}{2}}{2} + c$.

④ $\int \tan^{-1} x\,dx$

$= \int (1)\tan^{-1} x\,dx$ (v', u)

Pick $v = x$

$= x\tan^{-1} x - \frac{1}{2}\int \frac{2x}{1+x^2}\,dx$

$= x\tan^{-1} x - \frac{1}{2}\ln(1+x^2) + c$.