

## Sheet 4, Problem 2 — feedback

✓ Setup:  $u = x$ ,  $dv = e^x dx$  is the right choice, and  $du = dx$ ,  $v = e^x$  are both correct.

× Applying the formula: you wrote

$$\int x e^x dx = x e^x + \int e^x dx$$

but  $\int u dv = uv - \int v du$  carries a **minus** sign:

$$\int x e^x dx = x e^x - \int e^x dx = x e^x - e^x + C$$

*Your differentiation check on page 1 actually flagged this —  $\frac{d}{dx}(x e^x + e^x) = x e^x + 2e^x$ , an extra  $2e^x$  over the integrand. When a check fails, hunt the sign.*

× Part (b) inherits the sign error. With the corrected antiderivative:

$$\int_0^1 x e^x dx = [x e^x - e^x]_0^1 = (e - e) - (0 - 1) = 1$$

*Next: redo 2(b) yourself, then try two more parts-integrals and always run the derivative check.*