

$$\int \underbrace{x^2}_f \underbrace{e^x}_{g'} dx = \underbrace{x^2}_f \cdot \underbrace{e^x}_g - \int \underbrace{2x}_{f'} \cdot \underbrace{e^x}_g dx$$

$$\begin{aligned} \int x^2 e^x dx &= x^2 e^x - \int 2x e^x dx \\ &= x^2 e^x - 2 \int x e^x dx \\ &= x^2 e^x - 2(x e^x - e^x) \\ &= x^2 e^x - 2x e^x + 2e^x \\ &= (x^2 - 2x + 1) e^x \end{aligned}$$