

$$2.(i) \int \frac{\ln x}{x} dx$$

$$= \int v dv$$

$$= \frac{v^2}{2} + C$$

$$= \frac{(\ln x)^2}{2} + C$$

We use a  $v$ -substitution.  
 $v = \ln x \quad dv = \frac{dx}{x}$

Substitute  $v = \ln x$  into the equation.

$$(ii) \int x \cdot e^{-2x} dx$$

We use integration by parts.

$$u = x \quad v = -\frac{1}{2}e^{-2x}$$

$$du = dx \quad dv = e^{-2x}$$

$$uv - \int v du$$

$$= -\frac{1}{2}xe^{-2x} + \frac{1}{2} \int e^{-2x} dx$$

$$= -\frac{1}{2}xe^{-2x} - \frac{1}{4}e^{-2x} + C$$