Integration by Parts Questions

1. Use integration by parts to find $\int (1 - 2x)\mathrm{e}^{-2x}\,\mathrm{d}x$

2. Use integration by parts to find

$$\int_0^{\frac{1}{2}} x\,\mathrm{e}^{2x}\,\mathrm{d}x$$

3. (a) Find $\int \mathrm{e}^{4x}\,\mathrm{d}x$

    (b) Use integration by parts to find $\int \mathrm{e}^{4x}(2x + 1)\,\mathrm{d}x$

    (c) By using the substitution $u = 1 + \ln x$, or otherwise, find $\int \dfrac{1 + \ln x}{x}\,\mathrm{d}x$

Answers

1. $\text{Integral} = xe^{-2x} + C$

2. $\dfrac{1}{4}e - \dfrac{1}{4}e + \dfrac{1}{4} = \dfrac{1}{4}$

3. (a) $\dfrac{1}{4}e^{4x}$

   (b) $\dfrac{1}{4}(2x+1)e^{4x} - \dfrac{1}{8}e^{4x} \; (+c)$

   (c) $\dfrac{(1+\ln x)^2}{2} \; (+c)$