

Section 4: Integration by parts

Exercise level 3

1. (i) Use integration by parts to find $\int \cos^2 x \, dx$.

(ii) Hence find $\int \cos^4 x \, dx$.

2. (i) Let $I = \int e^{ax} \sin bx \, dx$. Use integration by parts twice to show that

$$I = \frac{e^{ax}}{a^2 + b^2} (a \sin bx - b \cos bx).$$

(ii) Hence evaluate $\int_0^{\infty} e^{-2x} \sin 3x \, dx$.

3. By first writing $e^{\sqrt{x}}$ as $x^{\frac{1}{2}} x^{-\frac{1}{2}} e^{x^{\frac{1}{2}}}$, find $\int e^{\sqrt{x}} \, dx$.

(Hint: use a suitable substitution first).