

(65) Integration by Parts

WORKING AT D/E

(1) Use the formula book and LATE to show that:

(a) $\int x \ln x \, dx = \frac{1}{2}x^2 \ln x - \int \frac{1}{2}x \, dx$

(b) Hence, find $\int x \ln x \, dx$

(2) Use integration by parts to show that

$$\int xe^x \, dx = xe^x - e^x + c$$

(3) Use the formula book to show each of the following integrals:

(a) $\int x \cos x \, dx = x \sin x + \cos x + c$

(b) $\int e^x \ln x \, dx = e^x \ln x - \int \frac{e^x}{x} \, dx + c$

WORKING AT B/C

(1) (a) Show that $\int_1^e x^2 \ln x \, dx = \frac{1}{9}(2e^2 + 1)$

(b) Show that $\int_0^{\frac{\pi}{2}} x \sin x \, dx = 1$

(2) Use the formula book to find $\int 2x \sec^2 x \, dx$

(3) Find each of the following. Give each answer in exact form showing full workings:

(a) $\int_0^2 xe^x \, dx$

(b) $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} 2x \cos x \, dx$

WORKING AT A*/A

(1) Show that $\int_0^1 x^2 e^{2x} \, dx = \frac{e^2 - 1}{4}$

(2) Evaluate $\int_1^{2e} \sqrt{x} \ln 2x \, dx$ giving your answer in exact form.

(3) Show that $\int e^x \sin x \, dx = \frac{e^x}{2}(\sin x - \cos x) + c$