Pre-STEP School online lecture series: Lecture 2– Question 2

4 Show that

$$\int_{-1}^{1} |x\,e^{x}|\,dx = -\int_{-1}^{0} x\,e^{x}\,dx + \int_{0}^{1} x\,e^{x}\,dx$$

and hence evaluate the integral.

Evaluate the following integrals:

(i) $\displaystyle\int_{0}^{4} |x^3 - 2x^2 - x + 2|\,dx$;

(ii) $\displaystyle\int_{-\pi}^{\pi} |\sin x + \cos x|\,dx$.

[2000 M1 no 8]

Please provide answers to the following discussion questions. Don't include full calculations in your responses, just explore the question and try to anticipate routes through it.

1. The first part of this question is trying to remind you of something and/or teach you something. What is it?

2. How will the idea that you looked at in the first bit of the question help you in part i). What maths techniques will you need in part i)?

3. Proceeding in the same way, what will you need to do deal with the integration in part ii)? What sort of equations will you need to solve?

Submit your answers by e-mail to stepeasterschool@maths.org by Friday 9th March 2012 with the subject line: Lecture 2 Question 2

Selected responses will be referred to in Lecture 2.