

MATH6103 Differential & Integral Calculus
MATH6500 Elementary Mathematics for Engineers

Problem Sheet 5

Date: 15/11/2011

Due Date: 25/11/2011

Answer all questions marked with an asterisk (*).

MATH6500 students: please remember to attach a cover sheet to your solutions.

1. Evaluate the following indefinite integrals.

(i) *

$$\int x^4 - 7x + 2\sqrt{x} \, dx$$

(ii)

$$\int \cos(1 - 2x) [2 + \sin((1 - 2x))]^3 \, dx$$

(iii) *

$$\int \frac{8}{4x + 3} \, dx$$

(iv) *

$$\int \left(1 + \frac{1}{x}\right) \sin(x + \ln(x)) \, dx$$

(v)

$$\int \frac{1}{x^2 + 3x + 2} \, dx$$

2. Evaluate the following definite integrals.

(i)

$$\int_0^\pi x \sin(1 - x^2) \, dx$$

(ii)

$$\int_{\pi/4}^{\pi/2} \frac{\cos x}{\sin x} \, dx$$

(iii)

$$\int_0^1 \frac{1}{1 + 5x^2} \, dx$$

(iv) *

$$\int_0^{\pi/4} \tan^2(x) dx$$

(v) *

$$\int_3^4 \frac{x^2 + 5}{x^3 + 2x^2 - x - 2} dx$$

3. [Try this] Calculate the value of

$$\int_0^N e^{-x} dx,$$

where N is some positive number (i.e. $N \in \mathbb{R}^+$). What is the total area under the graph of e^{-x} to the right of the y -axis? That is, what is the value of the integral as $N \rightarrow \infty$ (more strictly put $N = \infty$).