MATHEMATICS 2 (MA10193)
ASSESSED COURSEWORK

This is compulsory assessed coursework. You should hand your solutions to the questions below in to the Mathematics office in 1West by midday on Monday 23rd May 2005. Attempt all questions. All question carry equal marks. You may use a calculator, but you should indicate where you have done so. This assessment accounts for 25% of the marks on the mathematics component of this course: the other 75% will be accounted for by the exam. A copy of this sheet will be available on the web at `http://www.bath.ac.uk/~masgks/MA10193/assess.ps` *(or .dvi or .pdf).*

1. Consider the matrix
$$A = \begin{pmatrix} 2 & 10 & 5 \\ 1 & 3 & 1 \\ -1 & 1 & 2 \end{pmatrix}.$$

Write A as the sum of a symmetric and an anti-symmetric matrix. Find the eigenvalues and eigenvectors of A. What is the rank of A? Find all the solutions to the system of linear equations

$$2x + 10y + 5z = 12$$
$$x + 3y + z = 5$$
$$-x + y + 2z = -3.$$

2. Find the modulus and argument of the complex numbers $2+5i$, $3-5i$ and $(2+5i)(3-5i)$ Find the real and imaginary parts of the complex number of modulus 2 and argument $1/2$. Find all the complex solutions to the equation $x^3 - x^2 + 2x = 2$. Draw them on an Argand diagram.

3. Find all the solutions to the differential equation

$$\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 5y = 0$$

such that if $x = 0$ or $x = 1$ then $y = 0$.
Find all the solutions to the differential equation

$$\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 5y = x + 1.$$

GKS, 09/04/05