NUMERICAL LINEAR ALGEBRA
ACADEMIC YEAR 2007-2008

Theoretical assignment day 1

1. Let
$$A = \begin{pmatrix} 0 & 1 & 0 \\ -1 & 0 & 1 \\ 0 & -1 & 0 \end{pmatrix}.$$
   - Wat is the Range of A?
   - What is the Null space of A?
   - What is the rank of A?
   - What are the eigenvalues of A?
2. Proof that the condition number of an orthogonal matrix is equal to one. Also proof that orthogonal transformations preserve the 2-norm of a matrix.
3. Show that for p-norms
$$\|AB\|_p \leq \|A\|_p \|B\|_p.$$
4. Proof that the Frobenius norm a matrix norm is.
5. Proof that the induced norms are matrix norms.
6. Show that $fl(AB) = AB + E$ with $|E| \leq nu|A||B| + O(u^2)$