The purpose of this tutorial is to illustrate the appropriate level of clarity and completeness in <u>written proofs</u>, so that you know the standard which will be applied in grading assignments, and the exam.

Instructions: in groups, ① choose a problem ② discuss on the board and iterate until you find a solution ③ write a final version of your proof ④ your tutor will critique your proof ⑤ goto (①).

QI/ (i) Define the terms: permutation, cycle, transposition

(ii) Prove that every permutation may be written as a product of transpositions

The number of transpositions is well-defined mod 2 (this number  $|\mathcal{B}| \in \mathbb{Z}_2$ is called the sign of  $\mathcal{B}$ ).

$$Q_2$$
 Let X \in M\_n(IR) be an nxn matrix and define

$$det(X) = \sum_{\substack{\substack{\delta \in Sn}}} (-i)^{[\delta]} \chi_{12(i)} \chi_{26(2)} \cdots \chi_{n\delta(n)}$$

where [3] is the sign of a permutation 3ESn. Prove the following:

## In the following question the base field is IR.

2)