INTRODUCTION TO PROOFS
formerly called Foundation and Proofs
Notes by Dr. Lynne H. Walling

Note: You are expected to spend 3-4 hours per week working on this course outside of the lectures and tutorials. In this time you are expected to review the lecture notes, the comments on your homework, and the model solutions; work on your current homework assignment; neatly rewrite your homework solutions for submission to your tutor.

In these notes, many proofs refer to previously proved results or previously stated assumptions by restating the results or assumptions; this is how I expect you to refer to these things when you take the exam in this course. However, you may find it useful in studying to annotate these notes with the propostion/theorem/corollary number or the page number containing the result or assumption being invoked.

References for the course:

- Larry Gerstein, *Discrete Mathematics and Algebraic Structures*, W.H. Freeman and Company, 1987.
- D.J. Velleman, *How to Prove It: A Structured Approach*, Cambridge University Press, 2006.
- P.J. Eccles, *An Introduction to Mathematical Reasoning: Numbers, Sets and Functions*, Cambridge University Press, 1997.

The course is organised into the following sections.

§1. Introduction: Sets and Functions

§2. Truth tables, equivalences, and proof by contradiction

§3. Negations and contrapositives of propositions with quantifiers

§4. Set operations

§5. Partitioning sets, equivalence relations, and congruences

§6. Algorithms, recursion, and mathematical induction

§7. Strong induction and the Fundamental Theorem of Arithmetic

§8. Cardinality

§9. Uncountable sets and power sets

§10. More proofs using contradiction, construction, and induction

Information on HW and quizzes for Introduction to Proofs:

HW will be assigned on Tuesdays of odd numbered weeks. You also have tutorials for this course in the odd numbered weeks. Your tutorial leader will tell you when/where to turn in your HW. Solutions will be posted after an assignment has been collected in all tutorial sections.

The quizzes will be available through Blackboard in the even numbered weeks; you will get a message to tell you when each one is available, and for how long it will be available. You can log in multiple times to complete each quiz (while it is available). Each of the first 5 quizzes counts for 2of your mark for this portion of the course Introduction to Proofs and Group Theory. The 6th quiz will be to help you review.

The first half of the lecture notes and exercise problems are posted on Blackboard, and printed versions are available in room G90 in the Fry Mathematics Building. The homework problems will be selected from among these exercises.

Although the Problems Classes are at 10am on Fridays, you are strongly encouraged to attend.