Applied Algebra
Term Paper

General Information: You are encouraged to write an expository paper on some topic related to this course. This paper may count for 10% of your final grade, and so a fair amount of attention should be given to it. It may be an individual effort or a joint effort involving up to three people. If it is a joint effort, IT MUST TRUELY BE JOINT AND ALL PARTICIPANTS MUST BE ABLE TO ANSWER QUESTIONS ABOUT THE CONTENTS OF THE PAPER. The paper should be approximately 10-15 typed pages in length, although the important thing is full development of the material, not the actual length. So a good 5 page paper is acceptable (a shorter paper is probably not acceptable). The topic under discussion should be motivated and carefully developed. This should be followed by a discussion of the basic results in the area, giving proofs of the major theorems where relevant. A full bibliography should be given, and sources of the major theorems cited. Attention should be paid to spelling and grammar.

Due Dates:

Nov 5: A one page proposal which indicates your choice of topic and lists possible source materials. This proposal must be approved by either Gonzalez or Kra before proceeding to the next step.

Nov 26: A rough draft of the paper (optional).

Dec 12: The completed paper.

Topic: *Any* topic which is related to this course and can be covered in sufficient depth can be chosen. A historical account of some aspect of these areas (or a scientific biography of an important mathematician who worked in these areas) is also acceptable; in this case you should discuss the relevant mathematics in some detail. If you feel that your language skills are not up to this task, see me and we may be able to arrive at an alternative project (a computer program, for example). You are not required to prove new results, but you must synthesize material from more than one source, and present it in a coherent, readable manner.

Some Suggested Topics

Magic Squares
Diophantine Equations
Continued Fractions
Finite Fields
Pseudoprimes and Probablistic Factoring
Fermat's Last Theorem
Other Encryption Algorithms (DES, enciphering matricies, etc.)
Other Public Key Cryptosystems (Discrete Log, Knapsack, etc.)
The Continuum Hypothesis
The Axiom of Choice
Transfinite Induction
Cantor Sets
Boolean Algebras and Switching Circuits
Turing Machines
Formal Languages
Fast Addition and/or Sorting Algorithms
Finite Fourier Transforms; Fast Multiplication
Combinatorial Group Theory
Wallpaper Groups
Surfaces and Group Theory
Knots, Braids, and Groups
Graphs of Groups
Generators, Relations, and Free Groups
A Mathematical Analysis of the Rubik's Cube
Error Correcting Codes
A Historical Account of { Set Theory, Data Encryption, Number Theory, Algebra, ... }
Galois Theory