SM 362 Syllabus, USNA, Fall 2012, Munson

Logistics

Text: *Modern Algebra: An Introduction*, sixth edition, by J. Durbin.

Prerequisites: SM291.

Course Description

We will cover chapters I - VI, XIV, portions of chapters VII - VIII, and some additional material not in the textbook on the classification of groups of low order. This course is about the basic structures of algebra: groups, rings, and fields. They are fundamental to all of mathematics, and as a result (and despite their abstract nature), they can be applied to problems in other fields such as chemistry (isomers, chirality), physics (quantum mechanics and much else; groups are important in understanding the symmetries the basic laws of physics obey), cryptography, computer science, and many others. Many of the structures we will talk about are fundamental to all of mathematics, and thus are widely applicable, although we will not have much time to discuss applications outside of the purely mathematical. Despite the simplicity of many of these objects, they can interact in quite complicated ways, and the structures we will discuss are some of the jewels of human knowledge, although it is hard to appreciate this. Perhaps, many years down the road, you will begin to understand this.

Your experiences in SM291 (and to a lesser extent, SM233) will prove useful in two ways: (1) through your exposure to the connections between geometry and algebra, and (2) through your exposure to writing proofs and programs. This course will be more conceptual and abstract than any math course you have ever taken. I expect you to have a basic understanding of propositional calculus.

Goals

To introduce you to some of the most fundamental mathematical ideas and objects. To improve your ability to communicate mathematics, both written and orally, specifically through reading and writing proofs. One theme that will run throughout this course is that of symmetry. For instance, what are all of the symmetries of a certain geometric object (say, a tetrahedron), and what kind of algebra does this give rise to? Conversely, given the "group" of symmetries of a given object, how does the algebra of this group inform us of the geometry of the object in question?

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