

## Math 544, Projects for graduate students.

According to Graduate School policies, graduate students are expected to do approximately 30% more work than undergraduates. Graduate students in this course will, in addition to the above work, complete a long-term Project. These projects will constitute writing a paper on one of the topics below. Feel free to use any books, search on the web, talk to others.

The projects will be due on the last day of class, and they should be designed in consultation with the instructor. An agreement between student and instructor about what the Project will be should be in place by the end of Week 5.

### Possible project topics:

1. One-group numbers: describe all numbers  $n$  with the following property: all groups of order  $n$  are isomorphic to each other. For example prove that all groups of order 5865 are isomorphic.
2. Describe all finite subgroups of the group of rotations of 3 dimensional space.
3. Describe all 2-dimensional crystallographic groups (aka wallpaper groups), that is groups of symmetry of  $\mathbb{R}^2$  which contain a lattice (that is subgroup of  $(\mathbb{R}^2, +)$  generated by two linearly independent vectors) as a subgroup of finite index.
4. Describe the group of symmetries of Rubik's cube. In particular find the number of possible configurations in Rubik's cube.
5. Talk to me if you have your own idea for the project!