

Math 122 / Paper Topics

In place of a third midterm, students will be required to submit a 5-7 page expository paper on one of the topics below. This paper will count for 1/9-th of the course grade. For mathematics concentrators, these papers may be counted toward the junior paper requirement as well.

Students may elect to hand in the written assignment either in class on Monday, December 19, or in a location to be announced on Monday, January 9. The graders will grant no preference to papers submitted at one deadline over the other. Rather, the two deadlines are intended to allow students to make the choice of most convenience. The papers should be typed, either in an ordinary word processor or in LaTeX, which all students are encouraged to learn.

Paper topics are listed below with relevant sections from Artin noted. The use of other sources is highly encouraged, and students may elect to include specific examples related to these topics, where relevant. Remember, while the material covered in the paper need not contain any original work, the exposition must be original.

Questions regarding the logistics of the papers should be directed to Emily (erihl@fas).

Topics

1. Classify the finite subgroups of $SO(3)$. Cf Artin §4.5, 5.3 for some ideas though another text or some more work will be needed.
2. Define the ideal class group for the ring of integers in an imaginary quadratic field, prove it is finite, and give some examples where it is non-trivial. Cf Artin §11.10.
3. Define Hermitian forms and state and prove the spectral theorem for unitary transformations. Cf Artin §7.4, 7.5.
4. Describe Jordan canonical form for a linear transformation $T : V \rightarrow V$ of a finite dimensional complex vector space. Prove this decomposition exists, using the theory of modules over the ring $\mathbb{C}[x]$. Cf Artin §12.7.