

Mathematics 115A & 115AH

Beginning in Fall, 2005, these will be five unit courses, rather than the usual four units. There will now be five contact hours -- three with the instructor, and two with the teaching assistant. This will require more planning on the part of the instructor, and more coordination between instructor and TA.

It is important to understand the purpose of this change. One of the most difficult things that Mathematics students must learn is how to write proofs. To do so, they must be comfortable with elementary logic and must understand various techniques of proof, such as induction and proof by contradiction. They must also have a lot of practice writing proofs, and having their proofs read and critiqued. Our lower division courses do not emphasize this much, if at all. Mathematics 115A is ideally suited to teaching proofs for several reasons:

- (a) It is typically the first upper division Mathematics course a student takes.
- (b) It is taken by all Mathematics majors and many minors.
- (c) It follows a lower division course (Mathematics 33A), which contains the more computational part of the subject.

So, in addition to learning linear algebra, the instructor and TA should do as much as possible to ensure that students learn how to prove things in this course.

There are a number of views on how to best achieve this objective. The current idea is that one of the sessions with the TA will be spent in the traditional way - discussing homework and answering questions, while the second will be used in new and (hopefully) more creative ways. One possibility is to have the TA spend the hour lecturing on some material. Early in the quarter, this would cover techniques of proof, while later it would be more aligned to the subject matter of the course. Two outlines that could be used with this approach can be found [here](#). These could be combined or modified by the instructor. For example, one could cover section 2.6 (dual spaces), which makes the later treatment of adjoints in section 6.3 easier. A second possibility is to give a quiz at the beginning of the period, in which the students are asked to write down a proof. Then a few students could be asked to write their proofs on the board (simultaneously, to save time) and be critiqued by other students and the TA. (These quizzes would be graded by the TA.) Perhaps the best use of the hour is some combination of these ideas. In any case, the instructor is encouraged to give this some thought, and make the most effective use possible of this added resource.

In addition to benefiting the students, and making it likely that later upper division courses function more smoothly, this setup should have clear advantages for the TA. He/she will be more directly and independently involved in the educational process, and this will contribute to our training of future teachers, and will give the TA an additional item to discuss when applying for jobs. The instructor should regard this as an opportunity to help the TA become a better teacher. There should be more communication and collaboration between TA and instructor than is the case in other courses.