

**Homework in Math 129b**  
**Fall 2004**

**Expectations.** To do as well as you are capable of doing in Math 129b, you should expect to do

**12–15 hours of work each week outside of class.**

**Kinds of problems.** Two types of homework problems will be assigned in Math 129b:

1. A few problems will be calculations, where the answer to the problem is a number, or a graph, or a diagram. In these problems, show all your work, and if you use a new idea or clever method, indicate what kind of method you use.
2. The great majority of problems will be explanations/proofs, in which you are asked to “Show that ... ” or “Explain why ... ” something is true. In these problems, the point is basically to give an explanation in complete sentences. For more details, see the handout on writing proofs.

You will have several chances to work on, and revise, all homework problems. Specifically, this process has 3 steps: outline, submission, and revision.

1. An outline of each problem set will be due in the class before the completed version is due, and will be discussed briefly in that class. For example, the outline for problem set 01 is due **Mon Aug 30**. In that class, we will spend 5–10 min discussing that outline and what PS01 is asking you to do. PS01 itself is due on **Fri Sep 03**.

In each outline, you should do the following:

- (a) **Write down the definitions of all important new terms in the problem set** (e.g., span, linear independence, vector space). The point is to show that you understand what each question in the problem set is asking.  
You do not need to repeat definitions that have appeared before, just new ones. Also, you do not need to write out the theorems involved in each problem set.
- (b) **Write down the goal of each question.** The way you do this depends on the type of question.
  - If the question is a calculation, write down what kind of object you need to get for your final answer. (Again, if you do the same kind of calculation several times, you just need to describe the goal once.)
  - If the question is a proof, write down what you are **assuming** in your proof, and write down the **conclusion** you are trying to reach. (See the handout on proof for more about definitions, theorems, assumptions, and conclusions.)

Note that these outlines are meant to replace quizzes, and are therefore not supposed to take a lot of time. The point is to show that you are ready to get started on the problem set. See below for some suggestions on the outline for PS01.

**Late outlines will not be accepted**, but to allow for illness, etc., your lowest outline grade will be dropped.

2. Submit the completed version. You do not need to include your outline with the completed version.
3. After you get the graded problem set back, you have as many chances as you want to revise the problems as much as you like, usually until the next in-class exam. Each time you submit a revision, please attach the original completed version and all previous revisions, so I know how many points to add on to your score. (Please arrange the versions with the newest on the top, down to the original version on the bottom.) You do not need to revise/rewrite questions that you have previously gotten correct; just correct the ones you got wrong.

**Revising missed problem sets:** It is possible to “revise” a problem set that is not turned in on the due date. However, each time you miss a due date, all previous homework from missed due dates becomes unrevisable. Note that “missing” a due date can also include turning a homework that, in my judgement, does not represent a sufficient effort to continue with the course. (I’ll let you know quite clearly that your effort is insufficient if it happens.)

**Rules for working together:** The basic rule about working together is that you are encouraged to talk to each other about homework, as everyone learns from such discussion, but you are not allowed to copy solutions. Please also do not let others “borrow” or make xeroxes of your homework.

Homework copying will, in general, result in 0 grades both for the person copying and the person being copied from. After repeated offenses, I will file a report of academic dishonesty with the university.

### Guidelines for outlines

The outline for PS01 should go basically as follows.

*Relevant definitions:* It’s not a bad idea to collect all relevant new definitions at the beginning of your outline, though you can also mix them in if you prefer. For example:

**Defn.** A **vector space** is a set  $V$  with a definition of addition and scalar multiplication such that for all  $\mathbf{v}, \mathbf{w}, \mathbf{x} \in V$ ,  $r, s \in \mathbb{R}$ : (list axioms, etc.)

**Defn.**  $\mathbb{M}(2, 4)$  is: (give definition of what the elements of  $\mathbb{M}(2, 4)$  are, vector addition in  $\mathbb{M}(2, 4)$ , etc.)

And so on.

*Notes for each problem.* This will vary slightly from problem to problem.

For proof problems, you first figure out what is to be proven in “if-then” format. The “if” part is the assumption for the problem, and the “then” part is the conclusion. Examples:

2. *Assume:*  $V$  is a vector space,  $\mathbf{v} \in V$ ,  $\mathbf{v} \neq \mathbf{0}$ ,  $r, s \in \mathbb{R}$ ,  $r\mathbf{v} = s\mathbf{v}$ . *Conclude:*  $r = s$ .

4. *Assume:*  $r, s \in \mathbb{R}$ ,  $A \in \mathbb{M}(2, 4)$ . *Conclude:*  $(r + s)A = rA + sA$ .

For non-proof problems, or problems that may or may not involve proofs, you can be less rigid about what you write down. The point is to show that you have an idea of how to start the problem.

5. Try examples to see if  $V$  satisfies vector space axioms. If axioms fail in examples, find 2 axioms that fail and give counterexamples. If axioms seem to work in examples, prove that axioms 3, 4, 5, 7 hold for  $V$  (like problem 4).