Homework Requirements

For homework problem sets, which are due roughly every other week, discussion among students is permitted, but students MUST write up solutions independently on their own. No materials or sources from prior years' classes or from the Internet can be consulted. *Breaking the rules will result in expulsion.* Each student is required to make a copy of the course web page, sign it indicating that the honor code is understood, and turn it in to Jeff.

LaTeX should be used for typesetting homework solutions. Figures can be drawn by hand on a separate sheet of paper. More notes about LaTeX appear later in this handout

Proper Style for Writing Homework Solutions

You should read each section of the homework problems carefully and try working easier problems before working assigned problems. You may use the results of problems that appear earlier in the text than the problem you are doing. Answers must be clear and complete to be correct—don't leave out any steps. If you use a formula from the book or the result of a problem, be sure to explicitly reference it.

The task of writing homework solutions is well circumscribed. In this writing there is no need to provide motivation for considering the problem at hand and no need to generate the reader's interest. In fact, it should be assumed that the reader (TA) has already considered the problem thoroughly and is familiar with several possible solutions. Therefore the purpose of writing the homework paper is to convince the reader that you *completely* understand a solution to the problem.

All mathematical proofs involve an implicit understanding that notions are "obvious" to both writer and reader. In homework papers, some facts can never be considered obvious. These include all assumptions which are specific to the result being proved, plus most formulas which are derived in the textbook. Such facts must always be stated explicitly. Thus, in the sequence

$$y = \sum_{0 \le j \le n} x^j \tag{1}$$

$$= \frac{1 - x^{n+1}}{1 - x}, \tag{2}$$

the second equality can be justified on the basis of equation (A.6) in the

[CLRS] book, if we show that $x \neq 1$ can be assumed in the context of the problem.

On the other hand, many manipulations depend only on elementary algebra and can justifiably be abbreviated. For example, the sequence of manipulations

$$\begin{aligned}
x^n z^{n-1} &\leq e^n y && (3)\\
\ln x^n + \ln z^{n-1} &\leq \ln e^n + \ln y && (4)\\
n \ln x + (n-1)\ln z &\leq n \ln e + \ln y && (5)\\
n \ln x + (n-1)\ln z &\leq n + \ln y && (6)\\
\ln x + \ln z &\leq 1 + \frac{\ln y}{n} + \frac{\ln z}{n} && (7)
\end{aligned}$$

can be written

"$x^n z^{n-1} \leq e^n y$, so taking logs and rearranging, we have $\ln x + \ln z \leq 1 + \frac{\ln y}{n} + \frac{\ln z}{n}$."

If the next step is to drop the term $(\ln z)/n$ from the inequality, it must be justified—it is not valid in general. We could write

"But $0 < z < 1$ by assumption, so $\frac{\ln z}{n} < 0$ and $\ln x + \ln z \leq 1 + \frac{\ln y}{n}$."

The problem of how much to justify is difficult. (Was it necessary to state $(\ln z)/n < 0$ above?) It seems certain that there will never be a penalty for an excess of rigor, yet the reader will have an easier time of it when the pace varies according to the difficulty of the argument.

In the process of rewriting a rough set of notes into a finished homework paper, it may be useful to include indications of what manipulations brought the "inductive leap" to the solution. This perhaps makes the paper more useful for study later. But the distinctions between heuristic arguments leading to a solution and the solution itself must be kept clear.

During the rewriting, try to analyze what ideas are essential to the argument. At this point, a much more direct approach may become apparent, allowing extraneous details to be eliminated from the original proof. The organization of the paper can also be improved at this stage. Each problem or proof should be preceded by a statement of the result to be proved (especially if discovering the result was a part of the problem).

A typical proof should begin with what is known and build in a logical fashion until, at the end, the desired result is attained. Don't work backwards from the result toward what is known! You should make apparent at all times what has been assumed and what is to be proved.

For TEXperts

Miscellaneous notes for Jeff's students on how to write (available in a gzip-compressed postscript version or Adobe pdf version), plus the LATEX source file, the LATEX macros, a LATEX template file, a LATEX guide, and hypertext LATEX help, are available from the "Teaching Info" link from Jeff's home page http://www.cs.duke.edu/˜jsv/.

Grading Standards

In an effort to serve you better with consistent grading (and so that you'll know what the heck is going on), we've compiled the following grading guidelines. We'll try to follow them, but sometimes it might be appropriate to bend them somewhat, and we make occasional mistakes.

10: correct answer and proof

4–9: flawed proof: confused, missing cases, not rigorous

3–5: right answer, proof outline, but not a good proof

2: right answer but no proof

1: tried something correct (e.g., base cases)

0: not submitted, or nothing correct

Specific points off:

1: minor algebra mistakes

1: not putting answer in required form

1–3: poor wording of proof

1–5: failure to follow directions (e.g., proving something by one method when the problem asked for another)

1–5: failure to justify a not-so-obvious step (depending on its importance and difficulty)

Of course, for multipart problems, if the parts are not related, we will have to scale the scores for the parts.