Coded comments for mathematics papers (*Version for graders*)
18.310 Spring 2012

G **Use guiding text.** Guide the audience through the content (this comment applies at all scales from the paper scale to the paragraph scale and below).

G1 **What's your goal?** Say what you're going to do before you do it. *What is your goal?* (E.g., "We now determine a generating function for the a_i.")

G2 **Why?** Say *why* you're going to do it. (E.g., "*To find explicit expressions for the a_i,* we determine their generating function.")

G3 **Summarize your approach.** (E.g., "To determine the generating function for each k, we use relationships among the generating functions to write a system of equations. Solving this system yields the desired generating functions.")

G4 **Purpose of paragraph? section?** Be sure the purpose of each section and paragraph is clear at the start.

S **Structure paper & communicate structure** If a paper has many parts, structure it carefully and communicate that structure to readers.

S1 **Use sections** Break a long multi-part paper logically into sections.

S2 **Introduce problem: build intuition, remain nontechnical** Ideally, the paper's introduction should remain relatively nontechnical while giving readers a good intuitive grasp of what the problem is.

S3 **Paper's purpose s.b. in position of emphasis** In the introduction, clearly state the purpose(s) of the paper in a position of emphasis, like the start or end of a paragraph. (E.g., "In this paper, we find the steady-state distribution of the particles.")

S4 **Give outline of paper** In the introduction, let readers know what to expect in the paper. (E.g., "In Section 2 we briefly introduce Markov processes, which we use in Section 3 to model our problem.)

S5 **Put results & concl. in intro** In a math paper, it's common to state the paper's results and conclusions in the introduction.

S6 **No "Conclusion" section** Mathematics papers rarely end with a section titled "Conclusion" (see previous note). The paper may just end with the completion of the proof or problem.

S7 **Highlight main results w/in paper.** Within the body of the paper, make clear to readers which results are your main results.

A **Acknowledge others** It's professional to acknowledge the contributions of others. Examples are on stellar.

A1 **Wording must be your own.** Your writing, both the wording and the structure, must be your own (even the problem statement). One reason for this requirement is to ensure that you fully understand what you're writing. If your writing is based on a source, set the source aside while you write. After you're done, you may check for math errors but, once you understand the errors, set the source aside again as you correct them.

A2 **Acknowledge collaborators.** Collaboration is encouraged. Be sure to acknowledge your collaborators (otherwise you may appear to have plagiarized).

A3 **Paper should stand alone.** You may use information introduced in class, in the class notes, or in the problem statement, but include enough information in your writing so readers can follow your logical argument without referring to these. In other words, you may assume that your readers have mathematical background comparable to your typical classmate, but don't assume that your readers have attended class or read the class notes or the problem statement. (E.g., do *not* write "We obtain the generating function by using the strategy introduced in class" without summarizing that strategy.)

A4 **Cite figures** If you take a figure from elsewhere, cite the source in the figure caption. (E.g., "Figure 1. A cycle within a complete graph. Figure from [1, p.3].")

A5 **Cite sources** If your writing is based on a source, acknowledge the source and the extent to which you have used it. For examples, see the materials about acknowledging sources on stellar. (See also note A1.)

E **Integrate equations & text.** Equations and other mathematical expressions should integrate well with the text.

E1 **Equations are part of text. Punctuate them. Should read well.** Treat each equation (or other expression) as a grammatical part of the text within which it appears. Notice the punctuation at the end of each displayed equation in this example:

To simplify

$$xy + y = 2x^2 + 3x + 1,$$

we can divide both sides by $x + 1$ (because $x > 0$). So

$$y = 2x + 1.$$

E2 **Words vs. notation** When deciding whether to use words or notation, ask which would be easier for readers. (E.g., "There are more than 3 edges" is easier to read than "If n is the number of edges, then $n > 3$." In contrast, "$7 - n > 3$" is easier to read than "n less than seven is more than three.")

E3 **Be precise.** Definitions and theorems should be clear and correct. You may use looser language when motivating a definition or result, but statements and proofs must be mathematically precise.

E4 **Display equations.** To make the paper easy to read, "display" math by centering each expression on a line by itself (as in the example in note E1). Display math if it's long, if it's important, if you need to refer back to it, if readers need to be able to compare lines, if, left within the text, the equation would break across the end of a line or if it would stick into the right margin, or if displaying it would simply make the paper easier to read. (Often, simply rewording improves the situation.)

E5 **Put text between displayed equations.** Displayed math should usually be interspersed with text explaining how each line relates to the preceding lines, as in the example in note E1. If you have many equations with nothing between them, add explanations or ask yourself whether you're showing too many details. (The example in note E1 does not show the division by $x + 1$ but is still sufficiently clear for an audience of peers.)

E6 **Number (only) equations used later.** Number displays so you can refer to them later in the paper, but number only those to which you refer. (If you're using LaTeX, search online for "LaTeX suppress equation number.")

P **Revise and polish.** Leave time to set the paper aside for a while, reread, revise, and repeat (as many times as needed). After the content is correct and clearly presented, polish the paper.

P1 **Assess & improve structure.** Check your paper's structure by writing the main point of each paragraph in the margin to create an outline. Revise to create a more logical structure and/or to communicate the structure to readers.

P2 **Introduce all variables; use consistently** Check that all variables are introduced and are used consistently.

P3 **Starting sentence w/ symbol & separating expressions w/ comma** Don't start a sentence with a symbol: it's easier to read sentences that start with a capitalized word. Similarly, don't run math expressions together; separate them with words, not commas.

P4 **symbols as shorthand for text** Don't use mathematical symbols as shorthand in text (e.g., do *not* write "The number of edges is $> x$"); however, it is acceptable to include complete expressions in text (e.g., Because $x < 3$,...).

P5 **Make editing checklist** Make a personalized editing checklist for yourself. Include those things you often forget to do.

P6 **Spell check** Use a spell checker. Many LaTeX editors have a spell checker that ignores TeX code; if yours doesn't, you can strip the TeX code by copying from the pdf into a program that has a spell checker.

P7 **Have peer review** Have a classmate or someone else read over your draft, checking for grammatical errors, convoluted sentences, confusing explanations, etc. Return the favor, and acknowledge your collaborator.

P8 **Print to proofread** Print the paper to do a final proofreading: you'll catch errors on paper that you'd miss on screen.

L **LaTeX: search online** To learn how to do something in LaTeX, search online and skim to find a good response.

L1 **Left quotes** To create curly quotes like the ones on the left side of "this, type two single left quotes. The single left quote ` may be just left of the 1 on your keyboard.

L2 **Indents after displays** Indent only when you intend to start a new paragraph. To remove an indent after a displayed equation, remove the blank line from the tex code.

L3 **Symbols** If you're looking for a particular symbol, search online for "latex symbols." The Detexify website allows looking up symbols by drawing them, http://detexify.kirelabs.org/classify.html

L4 **Paragraph breaks** To start a new paragraph, add a blank line to the tex. To add space between paragraphs, use \smallskip, \medskip, \bigskip, \vspace{\baselineskip}, or a finer measure, e.g., \vspace[4pt].

T **Teach** If you use concepts that are new to your readers, design the paper to help the readers build understanding.

T1 **Use examples, nonexamples, illustrations** Add examples or illustrations whenever you can. A paper littered with examples is often easier to read. Make sure the examples illustrate as many of the subtleties of the definition or theorem as possible. Nonexamples are sometimes just as useful. (E.g., a planar graph K4 and the nonplanar graph K5).

T2 **Write inside out** Plan and write from the theorems out. In other words, write down the theorems you plan to prove, then list what examples you will need to help readers understand the theorem and what supporting lemmas you need to make the proof easier. Then list the definitions you need. Then list the examples you need to help readers understand the definitions.