

Administrivia

- I'm still working on grading Homework 5. I'm hoping to finish in time to include this assignment in the midsemester grades. One way or another I'll e-mail summaries of everything included in the midsemester grades and a letter grade.
- Reminder: Homework 6 due Wednesday.

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Minute Essay From Last Lecture

- When might `gnuplot` be useful? when you need to make quick graphs and might need to do repeated tweaking. when you want to customize. when you want to plot from data in text files (data entry in Excel is tedious).
- What do you use now? Excel, by-hand, `paint`, `LaTeX`, others.

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What are T_EX and L^AT_EX?

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- T_EX — program for typesetting mathematics, developed by Knuth (1978) for his book *The Art of Computer Programming* and made freely available. (How it came to be — a “side project” that turned into much more?)
- L^AT_EX — extensive set of macros for T_EX written by Lamport (1985), that provide functionality needed for scholarly papers. Extended over the years by many people.
- These are “text formatters” not “word processors”, and as such don’t include a built-in editor. (But there are IDE-like programs for working with them.)
- Basic idea — you write “source code” for your document (text and markup) with a text editor, then use T_EX or L^AT_EX to turn it into a formatted document.
- Both available in zero-cost form for many platforms.

Basics (Under UNIX)

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- You write “source” (`foo.tex`) with a text editor of your choice. It includes your text plus “logical markup” — e.g.,

```
\section{A Section Heading}.
```

(What about checking spelling? Use a separate tool — “each program should do one thing, and do it well.” `ispell` and `aspell` are common ones.)
- Traditionally, you use the command `latex` to generate a `.dvi` file, then `dvips` to generate PostScript, then (if desired) convert to PDF with `ps2pdf`. You can also go directly to PDF with `pdflatex`.

Isn't That a Lot of Trouble?

- In some ways, yes — there is a learning curve, and there are many “gotchas”.
- For some jobs (where visual layout matters more than logical structure), \LaTeX is probably the wrong tool.
- But if you persevere . . .

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Why It Might Be Worth the Trouble

- Output looks good — math in particular.
- Logical structure of document is clearly spelled out. (You can sort of do this with, e.g., MS Word, but it's less transparent.)
- Cross-referencing, bibliographic references, footnotes, tables of contents, indexing, etc., “just works”.
- Documents are stable — only way to “corrupt” a document is to mess up with your text editor. Very old documents usually still compile, and if they don't the content is still accessible.
- Once you figure out how to do a particular trick, it's there in the `.tex` source for future reference.
- If you want to generate a formatted document programmatically, \LaTeX source may be a good target.

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Basics, Continued

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- \LaTeX provides a small set of “document classes” — article, report, book, etc. These classes group definitions for section headers, lists, etc., in a way that everything looks good together. Also can have “packages” that group together related customizations, provide extra features.
- Basic document structure (look at example):
 - `\documentclass[options]{foo}`
 - Additional global definitions, packages, etc.
 - `\begin{document}`
 - Your text. “Paragraphs” delimited by blank lines.
 - `\end{document}`

Some Features

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- “Sectioning commands” provide consistent layout and automatic numbering. table of contents.
- “Environments” provide support for lists, tables, centered text, “verbatim”, etc.
- Predefined macros provide simple markup, e.g., `\textit{foo}`.
- Math — a bit cryptic, but IMO not worse than point-and-click equation editor.
- Graphics in EPS (Encapsulated PostScript) form can be included, and scaled nicely. `pdflatex` also accepts input in various popular graphics formats.

More Features

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- Figures and tables can “float” (L^AT_EX will put them where they fit). Also footnotes.
- Lots of cross-referencing features — declare symbolic label (for section, figure, etc.) with `\label{foo}`, reference with `\ref{foo}`.
- Support for bibliography / list of references — usually use companion package `BIBTEX`.
- Support for indexes. (Also glossaries, through add-on packages.)
- Facilities to define your own “commands” and “environments”. Makes it easy to get consistent formatting; also can provide convenient shorthand ways of doing things.

Gotchas

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- Some characters have special meaning and must be “escaped”: backslash, brackets, #, %, <, >, |, caret (^), underscore (_), tilde (~).
- Quotation marks should be entered as `‘ ’`. Dashes should be entered as `--` (“en dash”, suitable for connecting numbers, e.g., 1–100) or `---` (“em dash” — between words).
- Spaces after periods in the middle of a sentence should be followed by something to suppress intersentence space.

Advice For Getting Started

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- Get hold of an example that looks somewhat similar to what you want to produce, plus some sort of documentation — a guide from online or a book.
- Tinker with the example, putting in your prose and other stuff.
- When something doesn't work — I used to say “ask a local expert”, and that should work, but these days a Web search may well turn up good suggestions.

Using L^AT_EX

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- On our machines, the latest version (probably the most complete) is “TeXLive”. To access it,

```
module load tex-latest
```

(Put this in your `.bashrc` if you use it often.)
- Documents that include crossreferences and some other constructs need to be processed more than once (sort of as with C, compilers aren't required to be very smart). Command `latexmk` automates that (re“compiles” as many times as needed).
- If you want to install on your machine — be advised that the above needs kind of a lot of disk space.

Minute Essay

- What do you currently use to produce formatted documents? What do you like/dislike about it?
- Have you tried \LaTeX ? If so, what do/did you like/dislike about it? Anything you'd like to know how to do but don't?

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