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How LaTeX can save you time

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Abstract As first a physics professor and now a math and physics high school teacher, my teaching materials are always evolving and I am always looking for ways to make this easier for myself and to avoid reinventing the wheel (often my own wheel). Over the last three years, LaTeX has been a key part of that process.

1 Introduction

When I started teaching I used various word processors for preparing lecture notes, tests, quizzes, solutions, and all the other documents of teaching. I reserved LaTeX for research papers. Gradually two aspects of this became increasingly frustrating to me: editing equations was slow in a couple of different ways that I routinely ran into and as I switched between algebra-based and calculus-based versions of introductory physics I was either repeatedly swapping algebraic and calculus-based versions of material within my latest set of notes or else I was trying to remember to make additions and corrections to both versions of the course. The end result of this swapping was that I was forever digging through old notes in search of a diagram or a problem I'd used before and lost in some modification or other. Ultimately, it was the math that really pushed me to LaTeX. While it wasn't obvious to me at first that I could do much to improve my life with the parallel-courses issues, they at least weren't going to be any worse using LaTeX and working with math would be easier. Gradually, over the last three years, I have found ways to make organizing parallel courses easier. Along the way I've found ways to make numbers with units easily look nice and not split across lines. I've also gradually acquired some skill with assorted other tools useful for particular subjects I teach: combining mathematical and musical notation in one document; making detailed, repetitive drawings (mostly circuitry) that I can modify later without having to practically redraw from scratch.

2 Math

The most frequent speed-bump I ran into using standard word processors for class preparation was modifying entire sets of equations to a new font size or to replace the use of a specific symbol everywhere the symbol occurred. Traditional word processors required that I open each equation individually, modify it, click back out of the equation editor and then select the next equation. By contrast, in LaTeX I can change the font sizes used in every equation in the document by putting
`\DeclareMathSizes{display}{text}{super/subscript}{subsub/supersuper}` in the preamble of my document and replacing each word with a number which is assumed to be a font size in points (pt). If I only want one or a few equations to change size I can use the standard size-changing commands: tiny, scriptsize, footnotesize, small, normalsize, large, Large, LARGE, huge, Huge.

$$\sum \vec{F} = m\vec{a}$$

$$\vec{F} = \frac{\mathrm{d}\vec{p}}{\mathrm{d}t}$$

```
$$ \sum\vec{F}=m\vec{a} $$
{\tiny $$ \vec{F}=\frac{\mathrm{d}\vec{p}}{\mathrm{d}t} $$ }
```

Experienced users will note that I have used the deprecated `$$` markers for displayed equations. I usually have shortcuts set for `\[` to equal `\left[` and similarly for the right side which means I can't use those as the display-math commands as is standard. In practice, much of my math goes in the `\begin{align}...\end{align}` environment which is better for showing how to work out math problems because it supports multiple lines of math.

$$\begin{aligned} y &= y_0 + v_{0y}t + \frac{1}{2}a_y t^2 && (1)\\ &= v_0\sin(\theta)\frac{v_0\sin(\theta)}{g} - \frac{g}{2}\left(\frac{v_0\sin(\theta)}{g}\right)^2 && (2)\\ &= \frac{1}{2}\frac{v_0^2\sin^2(\theta)}{g} && (3) \end{aligned}$$

```
\begin{align}
y &= y_0+v_{0y}t+\frac{1}{2}a_y t^2 \\
&= v_0\sin(\theta)\frac{v_0\sin(\theta)}{g}-\frac{g}{2}\( \frac{v_0\sin(\theta)}{g} \)^2 \\
&= \frac{1}{2}\frac{v_0^2\sin^2(\theta)}{g}
\end{align}
```

When writing my lecture notes or solution sets for upper-level physics classes, I was often ending up with pages that were more math than text. As I made the transition from handwritten notes to computer-generated notes, I found that editing such notes in conventional word processors was excruciatingly slow. Part of this again is having to move into and out of the equation editor. Another part is the continuous updating of the equation while it is being typed. Another part is the slowness of scrolling past the equations. When I work with .tex files, I work in a text editor so I am never waiting for the computer to make the equations pretty. This makes modifying equations, in particular cutting and pasting from one equation to another, much faster. I also find scrolling through the final PDF file faster than scrolling through a similar file in a word processor.

The disadvantage to writing math in LaTeX is that we've invented pretty mathematical notation for a reason and plain-text forms are harder to read. If I am writing equations big enough that I'm having trouble reading them in LaTeX, or I'm actually doing the math as I type, I open LaTeXit so that the computer only has to typset the equation I'm working on rather than the entire document. For a single test this typically doesn't make much difference. However, if I have ten pages of notes that are mostly mathematics (my lecture notes for an upper-level physics class for instance), using LaTeXit on one equation at a time does speed up typing (or debugging) that equation.

Even with LaTeX typing math is slower than handwriting it. I find it worthwhile to take the extra time for things I expect to re-use for several reasons: it's more legible, I can use copy and paste to reduce errors when only small parts of an equation change from one step to the next, and I can insert extra steps, add comments, and make corrections much more quickly and neatly with electronic notes than I could ever do with handwritten notes.

There are a few other things about math in LaTeX that I particularly like. One is automatic equation numbering coupled with easy references to a numbered equation which are immune to rearrangements of the document. Another is that turning numbering off is easy, too. I also like being able to have math appear this way $\frac{\mathrm{d}s}{\mathrm{d}t}$ as easily as this way

$$\frac{\mathrm{d}s}{\mathrm{d}t}$$

just by typing `$ \frac{\mathrm{d}s}{\mathrm{d}t} $` versus
`$$ \frac{\mathrm{d}s}{\mathrm{d}t} $$`. (Again, I'm using deprecated nota-

tion. The current standards would be respectively
`\(\frac{\mathrm{d}s}{\mathrm{d}t}\)` and
`\[\frac{\mathrm{d}s}{\mathrm{d}t}\]` or alternatively
`\begin{math} \frac{\mathrm{d}s}{\mathrm{d}t} \end{math}` and
`\begin{displaymath} \frac{\mathrm{d}s}{\mathrm{d}t} \end{displaymath}`.)

3 Multiple Uses of Content

A major component of my teaching has been introductory physics at roughly three different levels. Sometimes I teach different levels in parallel, sometimes serially. Either way, I was having trouble keeping up with switching material in and out of my notes for different versions of the class and getting incremental improvements into all the versions of my courses. I could either start from the last time I had taught that level of the course and then add any appropriate improvements from more recent teachings of other levels or I could start with the most recent iteration of an introductory course and modify the level appropriately. Either way, I was doing a lot of work even if I used cut-and-paste to the hilt. In addition I kept losing material that I didn't use one time and then forgot to put back in the next time.

Having switched to LaTeX, I started looking for a LaTeX cure for these problems. A useful, but still fairly tedious, tool is using the % symbol at the beginning of a line to hide — comment out — certain material. This was faster than cutting it and loosing track of when I'd used it last and even faster than pasting to the bottom of a document and then remembering not to print the tail pages. A good text editor is helpful with this because chunks of a document can be selected and then commented out with one keyboard shortcut.

Still, I wasn't satisfied. When I switch from an algebra-based to a calculus-based version of the same material, there are whole sets of material that need to be swapped for each other. I didn't like spending the time to find them all or the fact that I usually missed at least one. The comment package solved my problems very neatly. I use it by putting `\usepackage{comment}` in the preamble of all my documents. Then, when I have content that should only show up for students in the calculus-based version of the class, the following appears in my .tex file.

```
\begin{calc}
Paragraphs, equations, sections, etc. for calculus-based class.
\end{calc}
```

Usually, there is a parallel section for the algebra-based section of the class, but it is not necessary. To include these chunks, I have a line in the preamble that says `\includecomment{calc}`. To exclude these chunks, that line changes to `\excludecomment{calc}`.

I also use the comment package for anything (tests, homework, ...) for which I might later post solutions. For example, each problem on my tests has the following structure.

```
\begin{topics}

\end{topics}
\begin{problem}{0}
    \begin{questions}

    \end{questions}
    \newpart{0}
        \begin{questions}

        \end{questions}
        \begin{work}
            \vspace{2in}
        \end{work}
        \begin{solutions}
             \begin{quotation}
                \noindent\textbf{Solution}

                \begin{align}
                   &
                \end{align}

            \end{quotation}
        \end{solutions}
        \begin{answers}
            \begin{quotation}
```

```
                \noindent\textbf{Answer}

                $\displaystyle   $

                \end{quotation}
        \end{answers}
        \begin{grading}
            {\color{red} { Grading
                \begin{itemize}
                    \item
                \end{itemize}
             }}
    \end{grading}
\end{problem}
```

Figure 1: The structure of a problem.

By setting the following commands in the preamble

```
\excludecomment{topics}
\includecomment{questions}
\includecomment{work}
\excludecomment{solutions}
\excludecomment{answers}
\excludecomment{grading}
```

the output will have the questions plus space for the students to work out their solutions. By changing what is included and excluded, a matter of changing pairs of letters, I can print questions with solutions or answers only, and various other combinations. Since all of these versions are coming from one file, any modifications I make need to be made in only one place and I always have the "right" file open. For instance, when grading papers, I usually work from the solutions, even if I won't ever post them. It is not uncommon to find that a large number of students misread a problem in a particular way that I want to fix in case I ever use the problem again. In the old days of having a test version and a solutions version, that meant opening another file and making the correction in two places. Now, the file is already open and I only have to make the correction once. The file SampleTest.tex contains a sample test file with a single, two-part problem in it.

The file SampleTest_SetForTest.tex shows how I set the includes and excludes to print out the test and its output is shown in SampleTest_SetForTest.pdf. Similarly, The file SampleTest_SetForSolutions.tex shows how I set the includes and excludes to print out solutions and the output is shown in SampleTest_SetForSolutions.pdf. Normally, there is no need to show the split for extra time in the solutions.

4 Speeding things up

I have found three things that make creating LaTeX faster. One is using the same content in multiple documents by referring to a single original document rather than by copying and pasting, a second is creating keyboard shortcuts, and the third is creating templates.

4.1 Include and Input

The \input{full-path-to-another-tex-file} command is very useful for repetitive content. I use it in writing syllabi, in content I use repeatedly within a class, and in conjunction with the includecomment{} command to create two courses from one master file. To organize the various files I use, I have the following folders: Common, Phys-Content, and then folders for each course.

LaTeX has two commands for combining files: \include and \input. As I was creating the structures outlined here for my own teaching, I found that the former gave me some problems depending on my directory structure, but the latter did not. Hence you will see \input in my examples.

There are substantial chunks of my syllabi that are the same for all the classes I teach either because they are based on school policy or they are basic policies I have for any class. I write a master syllabus for all classes and then where policies differed, I used the comment package to label chunks for inclusion and exclusion on a class-by-class basis. I put this master file in my Common folder and call it Desc-Policies.tex. In the folder for each class is a file called ClassName-Desc-Policies.tex. This file contains a series of \includecomment and \excludecomment statements in the preamble so that only the material for one class is included in the syllabus and \input{../Common/Desc-Policies.tex} is the only material between the \begin{document} and the \end{document} commands. The ../ at

the beginning of the path to the file tells the computer to go up one level in the file hierarchy within that folder to find the folder named Common. Year-to-year modifications and corrections again get made in one file and then I know all my syllabi will have that change next time I recreate the PDF output from the .tex file.

During the first few weeks of the year, I need to teach my physics students how to use a spreadsheet efficiently to analyze their data. This means that for the first several labs, I attach a long list of tips. Again, I used the `\input{path-to-file}` command and created a tips file separate from the weekly lab instructions. The `\input` command is faster than copying and pasting into two lab documents over a period of several weeks. In addition, over the first few weeks of this year, I rewrote sections of the introduction to more specifically address issues the students were having. Because my various labs pull the tips from a single file, I know that all my labs next year will have the latest version of that document. This file lives in the Labs folder inside the Phys-Content folder.

Labs generally have a three-file structure. The main file, stored in the Labs folder in Phys-Content, is called LabName.tex and contains the content of the lab: everything that goes between the `\begin{document}` and `\end{document}`. Usually the two classes aren't quite synchronized so at the very least there will be one due date for the AP students and a different one for the Honors students. Often there are also differences in the instructions: more detail is needed for the honors students or more rigorous data analysis techniques for the AP students.

```
\begin{AP}
Individual reports are due via email Feb. 3, 2011.
\end{AP}
\begin{Hons}
Individual reports are due via email Feb. 10, 2011.
\end{Hons}
```

In the respective folder for each class, I have another file that pulls the common content in and picks which set of alternative content to use. These files each have a preamble containing, among other things, the following commands.

```
\includecomment{AP}
\excludecomment{Hon}
\begin{document}
```

```
\center{\bf Physics Lab - LabName -
            Dr. Horner - 2010-2011}  %%%%%%% Title  %%%%%%%

\RaggedRight    % Because I like this look better.
\setlength{\parskip}{0.05in} % Because raggedright undoes paragraph
                                % skips and indents
\parindent=0.5in

%%% Content %%%
\input{../../Phys-Content/Labs/LabName.tex}
%%% End Content %%%
\end{document}
```

The only difference between the two files is swapping the "in" for "ex" at the top of the excerpt. This way, when I improve the lab for next year, I don't have to remember to make the changes twice.

4.2 Keyboard Shortcuts

Keyboard shortcuts can be for individual commands (such as we are accustomed to for opening, printing, and saving documents) or they can be for macros (sets of commands). For instance, I type a lot of fractions. Rather than typing out `\frac{}{}` every time, I have assigned the typing of that cluster of characters to option-command-f. Since the specific fraction $\frac{1}{2}$ also comes up a lot in my work, I have option-command-shift-f set to produce `\frac{1}{2}`. It does help to have some system for picking the keyboard shortcuts because forgotten shortcuts don't save time. The macros I am most dependent on are the ones that do the greatest amount of work for me. For instance, I have one that inserts the entire structure of a test problem at once, including indentation I find helpful, by hitting three keys (see 1). If the macros are done correctly, the undo command in the editor will take the whole chunk back out as well.

Other keyboard shortcuts I frequently use involve the process of turning a .tex file into a pretty document. I prefer PDF output and I don't normally want to see the various auxiliary files that LaTeX creates. Many text editors intended for use with LaTeX come with this shortcut built-in and generally the editors provide

a way for the set of commands to be tweaked. In my case, for example, I taught a course where I was using musical notation and mathematics frequently in the same document so I wrote a macro that executes that two-step process (send the music to a Lilypond, a musical equivalent of LaTeX, and then put the result into my LaTeX document) with a single function-key.

In all I have about three dozen macros assigned to keyboard shortcuts. Some of them I use in nearly every document I create. Others I created because I needed them for one particular project. A text editor **you** find helpful can do more than any single other thing to make LaTeX a time-saver.

4.3 Templates

Another kind of repeated content in using LaTeX is the preamble. I have one large template that I start all my files from. Alternatively, I could create test templates, lecture templates, lab templates. Using templates, either via a template mechanism in your text editor (the safe way) or by conscientiously using Save-As, is as big an asset in making the life of a teacher easier as keyboard shortcuts. Templates are by no means unique to LaTeX but they are very effective with it in part because the content and the layout are both visible in the document and it is easy to add content to the template without botching the formatting. Like macros, templates preserve tricks learned so that they are always in use even after a lapse of years during which a human would forget the trick.

5 Other Useful Tools

5.1 Slides and Notes

There are several slide-creator packages for LaTeX. I use Beamer. I do a lot with internal and external hyperlinks within Beamer and have also been happy with my ability to customize slide-layout and behavior. Here again, I end up using a cluster of files to produce the end product. For a typical set of lecture notes that I will use in different levels of introductory physics, I end up with five files. The biggest file I call Topic-content.tex. Like the lab file, that contains the material between the `\begin{document}` and the `\end{document}` commands and is stored in the Phys-Content folder, generally in a subfolder so that relevant figures or

other kinds of documents referred to are all grouped together. The content is separated out in two different ways. Beamer provides tools for putting some content only in the slide-show version (`\mode<presentation>{}`) and other content only in the posted-notes version (`\mode<article>{}`). In addition, I use the comment package to mark content as "algebra" (by using

```
\begin{algebra}
(stuff - must be whole slides or article-mode only)
\end{algebra}
```

or "calculus" so that by changing four letters I can produce notes for either version of the class. The three remaining files consist of preambles that select whether the output is a set of slides for projection in class (`\documentclass{beamer}`) or a set of notes (laid out very differently with `\documentclass{article}` plus `\usepackage{beamerarticle}` to save paper and ink and with additional content) for the algebra-based class (set with `\excludecomment{calc}` and `\includecomment{algebra}`) or for the calculus-based class (set with `\includecomment{calc}` and `\excludecomment{algebra}`). The first file gets stored in the same folder with Topic-content.tex and is called Topic-class.tex. In the respective folders for different classes are files the two files called Topic-postClassID.tex. This structure took me a while to figure out and set up, but now I can create a new unit by copying the four files, rewriting the content file and changing file names and references in the other three files. I can spend all my time on content creation and know that I can easily switch the level of the content next time I teach it. I'm not cutting content out in years I don't use it, I'm simply hiding it and I can hide all of it at once.

An example of generating slides for in-class use and a more-compact set of notes with some extra information is in the files `SampleContent.tex`, `SampleNotes.tex`, `SampleSlides.tex`, `SampleNotes.pdf`, and `SampleSlides.pdf`. The content file is necessary for compiling the notes and slides files. The slides file requires XeLaTeX although the notes version does not.

5.2 Writing Tests

I've already noted my use of the comment package to create tests and solutions from the same file. I also routinely use a tweaked version of the testpoints

file found at http://www.math.duke.edu/computing/tex/templates.html. (I've tweaked some font and spacing settings for my preferences.) The file makes layout of multi-part problems simple and pretty, does all the numbering for you (no more accidental 1,3,2,4,5 sequences after rearranging questions on different versions of the same test), and warns if point totals for parts don't add to the assigned points for the whole problem. It also tells how many points were assigned on the test. I've managed to lose track of a point or two on a test often enough to really appreciate having the latter check feature.

5.3 Numbers and Units

One of my pet peeves is having the units that go with a number wrap onto the next line. While I could do all my work without the siunitx package, I really like having it because, in addition to putting a non-breaking space between the number and the unit so that the two don't get split across the end of a line, it does a lot of pretty things from fairly simple input. In particular, it lets me keep track of units all the way through solutions to problems using my text font for units even inside math environments so that units and variables have distinct appearances. At the same time it keeps the font sizes appropriate (smaller as the fractions get more complex). It also just makes numbers and units look nice outside of equations; with my preamble settings, `\SI{29979.24580e4}{\m\per\s}` produces $29\,979.245\,80 \times 10^4 \, \frac{\mathrm{m}}{\mathrm{s}}$. This package, as with many of the packages I use, is capable of much more than I use.

6 Tweaking LaTeX

Only the first four items in this section really contribute to saving time. The rest are here to show you that LaTeX can be tweaked to suit your tastes and applications. The spacing commands matter more for my students printing the notes, and occasionally for test formats, than they do for my time. A skeleton document is listed in the appendix.

Sometimes the LaTeX command syntax isn't what I want. For example, LaTeX has the ability to make parentheses, brackets, and braces grow to match what they enclose. I almost always want to use this feature, but never want to wade through an equation filled with `\left( ... \right)` pairs in it. I find it hard to

parse. I therefore have the following (and matching for brackets and braces) in my preamble.

```
\renewcommand{\(}{\left(}
\renewcommand{\)}{\right)}
```

This permits me to type `\(\)` in my equations which is much easier to read. I have, of course, assigned a keyboard shortcut for insertion of that pair, with a space between and the cursor in the middle all ready for my input. Note that this redefines the current preferred short command for in-line math in LaTeX, however the deprecated `$` still works and is what I use.

I also define color shortcuts because I use colors in solutions to show cancellation and substitution connections. A keyboard shortcut wasn't enough because I prefer reading `\rd` to reading `\color{red}` as I proofread or update my documents.

Although I like the siunitx package, I find some of its syntax too cumbersome and there are a few units that I use for a week every year in introductory physics that aren't on its standard list. Therefore, I have a section of modifications to siunitx in my preamble (shown in the appendix).

There are various ways of setting up basic page geometry in LaTeX: paper size, margins, headers, etc. The geometry package makes it easy. At its most basic, it lets me set page height and width as well as top and left margins. The rest LaTeX computes itself. This is another package that I do not use even close to its fullest potential.

Beamer is another package that I use with several modifications. In this case I have created my own style files (by relatively minor modifications of files that come with Beamer). Of course if I'm not using Beamer in a particular document, I comment out that entire section.

Finally, I have found, especially in posting notes in two-column landscape mode, that I prefer the page layout that results from modifying several parameters that LaTeX uses in creating page layouts.

There are other things that I tweak in my preamble, but the final one that might be generally illuminating is my exam titles and instructions. I set both in definitions in the preamble. Often my exams have an in-class and a take-home component. Setting the title in the preamble and then just calling for it later in the document ensures that all the parts of the exam end up with the same title so

that when students come back to me with papers or sort their papers the pieces of the exam match. In addition, some of my students get extended time on tests and where I teach now this is handled by splitting the exam into two parts with one part to be taken later when the student has study hall. I always want to be sure that when I split up the exam, the second half has the same instructions for the study hall teacher as the first half had. Defining a command that echoes my instructions makes that easy.

This is a skeleton of my typical test file. I've included the whole preamble — including parts that are commented out as they would be when I actually use them — to show how I use various packages. The comments are my notes to myself about what I might want to use the packages for. Essentially, this preamble is the repository of most of what I know about using LaTeX effectively for my purposes.

7 File Output

Although there are many ways to produce PDF output these days, LaTeX does it automatically and PDF is by far the best way to post notes and solutions online for students. PDF files do not get mangled, they don't even get touched, by having the wrong version of a word processor on the wrong operating system. This is critical for files containing have math and drawings. In addition, most web browsers will open the PDF in the browser window. My college students' unsolicited feedback (because it hadn't occurred to me to ask) was that this is faster and simpler for them and they definitely preferred it to other formats that were used. Current PDF readers (at least on OS X and I think on Windows and Linux as well) permit students to circle material in downloaded PDF files and to attach notes to the files both of which can be saved.

8 Reflections and advice

I didn't become a fan of LaTeX until I saw past the very nice typesetting to the more valuable time-saving features. The speed of editing and copying and pasting of math combined with the ability to have multiple versions of a document a few keystrokes away won me over. I continue to find ways to simplify my life. So

far, I have found that when I've learned better ways of doing things, re-editing the files has taken less time than other conversions I've had to make. Using LaTeX is all about long-term re-usability of documents, in my opinion. Typing math is significantly slower than hand-writing math for most people. However, rewriting and rescanning because of a mistake half-way through the proof or inserting clarifications based on student response often takes longer than editing the typed material. LaTeX is a very versatile tool, but it does take time to learn what helps you. Do not embark on developing LaTeX materials the semester you are teaching an overload. Start with material you expect to re-use soon so that you will see the ease of modification sooner. Correct the typos in your notes after class because you really will be using them again. Lastly, borrow whenever you can: you don't have to reinvent the wheel of becoming a power-user.

A Sample Test Structure

Although this article is written in LaTeX, what I normally use in my daily work is actually XeLaTeX because it permits me to change fonts easily for a small subset of things I do and because it works better for incorporating music into my files via Lilypond.

```
%%%%%%% Comment unnecessary parts out with a % at line start (repetition, end %s cosmetic)  %%%%%
%%%%% Choose an appropriate document type - more permutations exist %%%%%
\documentclass[12pt]{article}   % basic
%\documentclass[12pt, twocolumn, landscape]{article}  % best readability and compactness for math
%\documentclass[hyperref={colorlinks=true, linkcolor=orange, pagebackref=true}]{beamer} % Presentation Mode
% hyperref part creates clickable links in pdf output, pagebackref goes from bib back to main doc,
% orange is visible on all relevant backgrounds for normal and most common 3 kinds of color
% blindness according to Color Oracle
%%%%% End Choose document type %%%%%
%\usepackage{beamerarticle}   % so all those beamer commands for making a nice presentation get interpreted sanely for this version
\usepackage{graphicx}  % include and modify images
\usepackage[hang,small,bf]{caption}    % modify figure and table captions; captions outside figure and table
\usepackage{amsmath, amsthm}   % math
%\usepackage[greek,english]{babel}  % type chunks in Greek
\usepackage{multicol}  % vary # of columns w/in doc w/o new page
\usepackage{fontspec}  % redefine default fonts easily; specifically to use energy bar font
\usepackage{paralist}  % set symbol with each enumerate; enumerate in a row too (add your own spaces)
\usepackage{comment}   % multiple versions of document produced by including/excluding (non-contiguous) chunks
\usepackage{color}    % use color in text and math
%\usepackage{tikz} % draw via command directly in document - cross between CAD and GeoGebra
%\usetikzlibrary{positioning,arrows,decorations.pathmorphing,scopes,calc} % some extra tikz goodies
%\usepackage{rotating} % put text in rotated by any angle (use minipage)
\usepackage[per-mode=fraction,sticky-per=true,load-configurations=abbreviations,separate-uncertainty=true]{siunitx}
% unitalicized units in math modes, non-breaking space between number and units everywhere, fractions in units
% w/o going into math mode
\usepackage{ragged2e}  % to avoid justified type which is generally ugly
\usepackage[total={7.25in,9.75in}, top=0.5in, left=0.75in]{geometry}  %margin and orientation setting
\usepackage[xetex,pagebackref=true,colorlinks=true,linkcolor=blue]{hyperref}  % internal and external clickable links; MUST BE LAST
%%%%% Beamer default options I like %%%%%
%\usetheme[hideothersubsections, right]{Edwardsville}  %set overall slide style - my mod of Marburg.sty
%\setbeamercovered{highly dynamic}
% % main options are:
% % invisible -- can't see at all
```

```
% % transparent<=opaqueness> -- mix with background so not completely there
% % dynamic -- mix depends on steps to/from uncovering
% % highly dynamic -- more so
%\setbeamertemplate{navigation symbols}{}  % don't show nav symbols on each slide (too small to use)
%\setbeamertemplate{bibliography item}[text]  % show number instead of symbol to link to bib
%\setbeamercolor{alerted text}{fg=orange}    % orange as acceptable contrast on blue and white for most visions
%%%%% End Beamer stuff %%%%%
\input{testpoints}   % create the problem environment and assign points (in folder with test file or in texmf-local)
%%%%%  Spacing refinements  %%%%%%
%separate rows of arrays just a tad more
\renewcommand{\arraystretch}{1.2}
% shrink vertical space in lists
\newenvironment{enumerate*}{\begin{enumerate}\setlength{\itemsep}{-2pt}}{\end{enumerate}}
\newenvironment{itemize*}{\begin{itemize}\setlength{\itemsep}{-2pt}}{\end{itemize}}
% Alter the LaTeX defaults so in-line math will hardly ever break across a line
\relpenalty=9999
\binoppenalty=9999
% Alter some LaTeX defaults for better treatment of figures to fit better on page:
% See p.105 of "TeX Unbound" for suggested values.
% See pp. 199-200 of Lamport's "LaTeX" book for details.
%   General parameters, for ALL pages:
\renewcommand{\topfraction}{0.99} % max fraction of floats at top
\renewcommand{\bottomfraction}{0.99} % max fraction of floats at bottom
%   Parameters for TEXT pages (not float pages):
\setcounter{topnumber}{6}
\setcounter{bottomnumber}{6}
\setcounter{totalnumber}{12}     % 2 may work better
\setcounter{dbltopnumber}{2}    % for 2-column pages
\renewcommand{\dbltopfraction}{0.9} % fit big float above 2-col. text
\renewcommand{\textfraction}{0.01} % allow minimal text w. figs
%   Parameters for FLOAT pages (not text pages):
\renewcommand{\floatpagefraction}{0.9} % require fuller float pages
% N.B.: floatpagefraction MUST be less than topfraction !!
\renewcommand{\dblfloatpagefraction}{0.9} % require fuller float pages
%%%%%  End Spacing refinements  %%%%%
%%%%% Color %%%%%
%color redefinitions (cyan and blue defaults were too close)
\definecolor{DarkBlue}{rgb}{0.1,0.1,0.9}
\definecolor{RealCyan}{rgb}{0.2,0.7,0.9}
%color shortcuts
\newcommand{\rd}{\color{red}}
\newcommand{\bl}{\color{DarkBlue}}
\newcommand{\gr}{\color{green}}
\newcommand{\mt}{\color{magenta}}
\newcommand{\cy}{\color{RealCyan}}
%%%%% End Color %%%%%
%%%%% Numbering %%%%%
%Set the enumerate labels to go in the order A I a i
\renewcommand{\theenumi}{\Alph{enumi}}
\renewcommand{\labelenumi}{\theenumi}
\renewcommand{\theenumii}{\Roman{enumii}}
\renewcommand{\labelenumii}{\theenumii}
\renewcommand{\theenumiii}{\alph{enumiii}}
\renewcommand{\labelenumiii}{\theenumiii}
\renewcommand{\theenumiv}{\roman{enumiv}}
\renewcommand{\labelenumiv}{\theenumiv}
%%%%% End Numbering  %%%%%
%%%%% Other shortcuts %%%%%
%create shortcut for the autoscaled (), [], <>, and || - don't autocolor becuase it breaks ^ placement
\renewcommand{\(}{\left(}
\renewcommand{\)}{\right)}
\renewcommand{\[}{\left[}
\renewcommand{\]}{\right]}
\newcommand{\<}{\left\langle}
\renewcommand{\>}{\right\rangle}
\renewcommand{\|}{\left|}
%end (), [], <>, || automation
\providecommand{\e}[1]{\ensuremath{\times 10^{#1}}}   %short-cut for powers of ten
%%%% End Other shortcuts %%%%%
%%%%% modifications to SIunitx %%%%%
\DeclareSIPostPower\sq{2}   % briefer squaring than default; XeTeX croaks on \2 here
\DeclareSIPostPower\3{3} % briefer cubing than default
```

```
\DeclareSIPostPower\4{4} % briefer fourth power than default
\DeclareSIUnit\lightyear{ly} % units I use occasionally that aren't predefined in siunitx
\DeclareSIUnit\torr{torr}
\DeclareSIUnit\gauss{G}
\DeclareSIUnit\J{J}
%%%%% end modifications to SIunitx %%%%%
%%%%% Use EnergyBar font %%%%%
%extra font for energy bars
\setmonofont{EnergyBar}
%now fix urls so they don't come out in energybar font
\urlstyle{same}
%%%%%  End Use EnergyBar font %%%%%
%create annotated and unannotated output from this file by changing include <-> exclude
\excludecomment{topics}
\includecomment{questions}
\includecomment{work}
\excludecomment{solutions}
\excludecomment{answers}
\excludecomment{grading}

\newcommand{\mytitle}{\noindent\textbf{ Test 8 Ch 5 - AP Calculus BC - Dr. Horner - 2010-2011 \hspace{0.25in}NAME}}
\newcommand{\inrules}{{\bf Directions:} Show as much detail as possible for partial credit. Use proper mathematical
notation.  Make explanations short but accurate. Place final answers in a box and be sure your presentation is in
a clear, logical format.  You may use your calculators.}

\begin{document}

\RaggedRight
\setlength{\parskip}{0.05in}   % Because raggedright undoes paragraph skips and indents
\parindent=0.5in

\mytitle   %%%%%%% Title %%%%%%%

\inrules

%%% Content %%%

% questions

\newpage
\mytitle

\inrules

% more questions - split is for a student who gets extra time and takes half the test in study hall

\newpage
\mytitle

ALL WORK MUST BE YOUR OWN.  YOU MAY USE {\bf YOUR} TEXT, {\bf YOUR} NOTES AND YOUR CALCULATOR, BUT NOT ANY OTHER
MATERIALS NOR MAY YOU DISCUSS (in any form) THESE QUESTIONS OR ANY MATHEMATICS WITH ANYONE ELSE. THE
CONSEQUENCES OF ANY VIOLATION OF THIS TRUST ARE SEVERE. I fully understand the above statement and have
complied with all it states:

Sign Here {\underline{\hspace{3in}}}
\vspace{0.25in}

PAPERS ARE DUE BY 8:10AM NEXT SCHOOL DAY IN ROOM 119 OR TO XXX.

Email me if you feel you need clarification of any questions.

% take-home question

%%% End Content %%%
\showpoints
\end{document}
```