Sample LaTeX File

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Abstract

This document represents the output from the file "sample.tex" once compiled using your favorite LaTeXcompiler. This file should serve as a good example of the basic structure of a ".tex" file as well as many of the most basic commands needed for typesetting documents involving mathematical symbols and expressions. For more of a description on how each command works, please consult the links found on our course webpage.

1 Lists

1. **First Point (Bold Face)**
2. *Second Point (Italic)*
3. Third Point (Large Font)
   (a) First Subpoint (Small Font)
   (b) Second Subpoint (Tiny Font)
   (c) Third Subpoint (Huge Font)

- Bullet Point (Sans Serif)
- Circle Point (Small Caps)

2 Nonsense

A Simple Sample LaTeX File

Stupid Stuff I Wish Someone Had Told Me Four Years Ago
(Read the .tex file along with this or it won't make much sense)

The first thing to realize about LaTeX is that it is not "WYSIWYG". In other words, it isn't a word processor; what you type into your .tex file is not what you'll see in your .dvi file. For example, LaTeX will completely ignore extra spaces within a line of your .tex file. Pressing return in the middle of a line will not register in your .dvi file. However, a double carriage-return is read as a paragraph break.

Like this. But any carriage-returns after the first two will be completely ignored; in other words, you
can't
add

more
space
between
lines, no matter how many times you press return in your .tex file.

In order to add vertical space you have to use "vspace"; for example, you could add an inch of space by typing `\vspace{1in}`, like this:

To get three lines of space you would type `\vspace{3pc}` ("pc" stands for "pica", a font-relative size), like this:

Notice that LaTeX commands are always preceeded by a backslash. Some commands, like `\vspace`, take arguments (here, a length) in curly brackets.

The second important thing to notice about LaTeX is that you type in various "environments"...so far we've just been typing regular text (except for a few inescapable usages of `\verb` and the centered, smallcaps, large title). There are basically two ways that you can enter and/or exit an environment;

this is the first way...

this is the second way.

Actually there is one more way, used above; for example, THIS WAY. The way that you get in and out of environment varies depending on which kind of environment you want; for example, you use `\underline` "outside", but `\it` "inside"; notice this versus *this*.

The real power of LaTeX (for us) is in the math environment. You push and pop out of the math environment by typing `$`. For example, $2x^3 - 1 = 5$ is typed between dollar signs as `$2x^3 - 1 = 5$`. Perhaps a more interesting example is $\lim_{N\to\infty} \sum_{k=1}^{N} f(t_k)\Delta t$.

You can get a fancier, display-style math environment by enclosing your equation with double dollar signs. This will center your equation, and display sub- and super-scripts in a more readable fashion:

$$\lim_{N\to\infty} \sum_{k=1}^{N} f(t_k)\Delta t.$$

If you don't want your equation to be centered, but you want the nice indicies and all that, you can use `\displaystyle` and get your formula "in-line"; using our example this is $\lim_{N\to\infty} \sum_{k=1}^{N} f(t_k)\Delta t$. Of course this can screw up your line spacing a little bit.

There are many more things to know about LaTeX and we can't possibly talk about them all here. You can use LaTeX to get tables, commutative diagrams, figures, aligned equations, cross-references, labels, matrices, and all manner of strange things into your documents. You can control margins, spacing, alignment, *et cetera* to higher degrees of accuracy than the human eye can percieve. You can waste entire days typesetting documents to be "just so". In short, LaTeX rules.

The best way to learn LaTeX is by example. Get yourself a bunch of .tex files, see what kind of output they produce, and figure out how to modify them to do what you want. There are many template and sample files on the department LaTeX page and in real life in the big binder that should be in the computer lab somewhere. Good luck!

3 student

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This is a sample file in the text formatter LaTeX. I require you to use it for the following reasons:

- It produces the best output of text, figures, and equations of any program I've seen.
- It is machine-independent. It runs on Linux, Macintosh (see `TeXShop`), and Windows (see `MiKTeX`) machines. You can e-mail `ASCII` text versions of most relevant files.
- It is the tool of choice for many research scientists and engineers. Many journals accept LaTeX submissions, and many books are written in LaTeX.

Some basic instructions are given next. Put your text in here. You can be a little sloppy about spacing. It adjusts the text to look good. You can make the text smaller.

Skip a line for a new paragraph. You can use italics (*e.g. Thermodynamics is everywhere*) or **bold**. Greek letters are a snap: Ψ, ψ, Φ, ϕ. Equations within text are easy— A well known Maxwell thermodynamic relation is $\left.\frac{\partial T}{\partial p}\right|_s = \left.\frac{\partial v}{\partial s}\right|_p$. You can also set aside equations like so:

$$du = Tds - pdv, \qquad \text{first law} \tag{1}$$

$$ds \geq \frac{dq}{T}. \qquad \text{second law} \tag{2}$$

Eq. (2) is the second law. References[1] are available. If you have an postscript file, say `sample.figure.eps`, in the same local directory, you can insert the file as a figure. Figure **??**, below, plots an isotherm for air modeled as an ideal gas.

Running LaTeX

You can create a LaTeX file with any text editor (`vi`, `emacs`, `gedit`, etc.). To get a document, you need to run the LaTeX application on the text file. The text file must have the suffix "`.tex`" On a Linux cluster machine, this is done via the command

```
latex file.tex
```

This generates three files: `file.dvi`, `file.aux`, and `file.log`. The most important is `file.dvi`.

The finished product can be previewed in the following way. Execute the commands:

```
dvipdf file.dvi                                    Linux System
```

This command generates `file.pdf`. Alternatively, you can use `TeXShop` on a Macintosh or `MiKTeX` on a Windows-based machine. The `.tex` file must have a closing statement as below.

[1] Lamport, L., 1986, *LaTeX: User's Guide & Reference Manual*, Addison-Wesley: Reading, Massachusetts.

4 Equations

4.1 Binomial Theorem

Theorem 1 (Binomial Theorem) *For any nonnegative integer n, we have*

$$(1+x)^n = \sum_{i=0}^{n} \binom{n}{i} x^i$$

4.2 Taylor Series

The Taylor series expansion for the function e^x is given by

$$e^x = 1 + x + \frac{x^2}{2} + \frac{x^3}{6} + \cdots = \sum_{n \geq 0} \frac{x^n}{n!} \tag{3}$$

4.3 Sets

Theorem 2 *For any sets A, B and C, we have*

$$(A \cup B) - (C - A) = A \cup (B - C)$$

Proof:

$$\begin{aligned}
(A \cup B) - (C - A) &= (A \cup B) \cap (C - A)^c \\
&= (A \cup B) \cap (C \cap A^c)^c \\
&= (A \cup B) \cap (C^c \cup A) \\
&= A \cup (B \cap C^c) \\
&= A \cup (B - C)
\end{aligned}$$

□

5 Tables

left justified	center	right justified
1	3.14159	5
2.4678	3	1234
3.4678	6.14159	1239

6 A Picture