Latex Session 2010

Your name here
Department of Physics and Astronomy, University of British Columbia
6224 Agricultural Road, Vancouver, British Columbia, Canada, V6T 1Z1
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We demonstrate methods for creating nice-looking PDFs for research papers including mathematical formulae, figures, tables, and bibliographies using LaTeX!

I. INTRODUCTION

You can use latex to do all of the things word processors can do, like **bold** and *italics*. We can make fonts that are bigger or even bigger and also fonts that are really small.

New paragraphs like this one are automatically indented according to the document class that you declared at the begining of the file. Note that actual indenting in the .tex file is ignored. You can start or end a line wherever you want. LaTeX will only start a new paragraph if you leave a blank line. If you want
to end
a line early
you have to use
two backslashes.

This document uses the `RevTeX4` class, which is the standard for all APS journals. It is also the standard for PHYS/ASTRO 449, which is why we are using it here. The options in the square brackets of the `\documentclass` command define various properties of the document including number of columns and global text size. If you want to see what a simpler format looks like, you can comment out the `\documentclass` line in the preamble and uncomment the two lines above it. You will also have to move the `\maketitle` command to just before the abstract, and comment out both lines of the affiliation command, because of the slightly different way the two document classes handle titles.

You can use the `\noindent` command to force a new paragraph to not be indented. Also, notice that above when I wrote `\noindent`, LaTeX did not interpret it as a command, but as text. To do this I used the `\verb` command.

II. EQUATIONS

One of the most popular features of LaTeX is the ability to make nice looking math equations. Here are some examples:

$$\frac{\partial u}{\partial t} = \alpha^2 \frac{\partial^2 u}{\partial x^2} \tag{1}$$

$$\int_\alpha^\beta e^{-\frac{{\Gamma_0}^2 \omega b x}{q \sigma \epsilon}} \sin\left(\frac{23}{17}\pi x\right) dx \tag{2}$$

Note that if you give your equations labels, then you can reference them in the text, like this: Equation 1 and Equation 2. The advantage of using these types of references is that they will always refer to the correct equation, even if you add more in later or rearrange them.

There are no limits to what you can do with LaTeX equations. You can make matrices and vectors or whatever you like, just Google it.

A. Inline equations

Sometimes you want to have a short bit of math inside the text, like this: $h\nu = \hbar\omega$. To do this you can surround your math with \$'s.

B. Align

If you want to have a derivation that take multiple lines and have all the equal signs line up, we can use the align environment:

$$\begin{aligned} 2x^2 + 3(x-1)(x-2) &= 2x^2 + 3(x^2 - 3x + 2) \\ &= 2x^2 + 3x^2 - 9x + 6 \\ &= 5x^2 - 9x + 6 \end{aligned}$$

Note that with both the `eqaution` and `align` environments, if you put an asterix after the name in the begin statments (e.g. `\begin{align*}`), the equations will not be numbered. The same thing works for sections and subsetions. For example the next section has no number:

FLOATS

Floats are things that LaTeX will intelligently place within your text. The most common types of floats are figures and tables.

C. Figures

The standard package to use for images is graphicx. We start by creating a `figure` environment, then a `center` environment. The figure environment tells LaTeX "I am a float, you get to put me somewhere

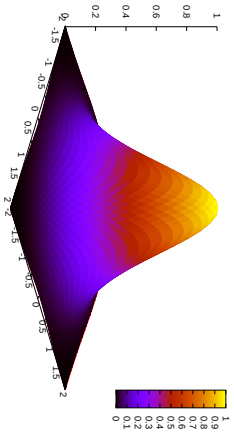

FIG. 1. This is a figure

x	x^2
1	1
2	4
3	9
4	16
5	25

TABLE I. This is a table

to make efficient use of space!". The center environment ensures it's centred in the column. We use the `\includegraphics` command to include the actual figure. If you're using `LaTeX`, not `PDFLaTeX` the figure should be in postscript (.ps or .eps) format. If you're using `PDFLaTeX`, the figure can be a .jpg, .png, or .pdf file. Note that options in square brackets allow you to scale or rotate the image. Lastly we add a caption, and give the figure a label so we can refer to it in the text (see Figure 1).

D. Tables

Tables in LaTeX can sometimes seem tedious, but they are very flexible. Note that to make a table we need two environments: first we need the `table` environment to make a float which can contain, among other things, captions, and then we need the `tablular` environment to actually define the contents of the table. Technically you could make a table with just the `tablular` environment, but then it would not be placed intelligently like other floats and could not be referenced like Table I. Right after the `\begin{tabular}` command, we define some options about the columns. I have written `|l|r|`, which means we have two columns, the first is left-aligned, and the second is right-algined. The vertical lines or 'pipes' for us 'Nix nerds mean that there should be a vertical line on the outsides of the table and separating the columns.

x	x^2
1	1
2	4
3	9
4	16
5	25

TABLE II. This is a trendy table

In the content of the table, you should write `\hline` every time you want to a horizontal line, and then separate each column with an &. Also every line that isn't an `\hline` should be ended by two backslashses.

Table II shows how you can change some of the above options to make a more trendy looking table.

One last comment on floats is that if you don't like where LaTeX puts them and you really think it should go HERE, then you can force it to by putting `[h]` right after the `\begin{table}` or `\begin{figure}`, like Figure 2, which should be right here:

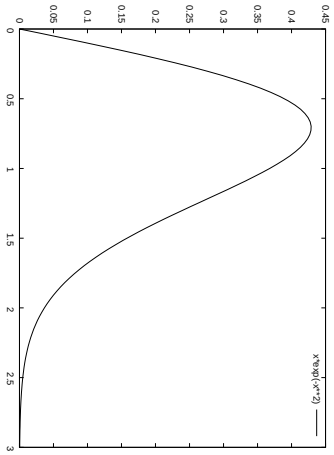

FIG. 2. This is right here

III. BIBILOGRAPHY

The best and most flexible way to make a biliography in latex is to use an extention called BibTeX, but that is somewhat complicated and beyond the scope of this session. There is a good standard environment which works well as long as you don't want to get too fancy. It's called `thebibliography` and you can use it to cite things in the text[2]. Note that the number will always be consistent and will reflect adding or rearranging entries[1].

[1] Author, I. N. (Year). Title of the article. Title of the Journal or Periodical, volume number, page numbers.

[2] Smith, L. V. (2000). Referencing articles in APA format. APA Format Weekly, 34, 4-10.