Your homework is to replicate this document, including some lists, some mathematics, a table, and a diagram. Email me the \LaTeX{} form so I can make corrections—if in fact you do something wrong! [http://people.rit.edu/vwlsps/](http://people.rit.edu/vwlsps/)

For the Mac the recommended package is TeXshop, freeware available at [http://www.uoregon.edu/~koch/texshop/](http://www.uoregon.edu/~koch/texshop/). For the PC, the recommended package is Protext is available at [http://tug.org/protext/](http://tug.org/protext/). I recommend you install a \LaTeX{} package as it is a recommended method for your capstone papers.

Your source code consists of two parts, the preamble containing items like what packages to use, and the document, containing the items that will go into document. Key packages that you want to include (via `\usepackage{...}`) are `geometry`, `parskip`, `graphicx`, `amssymb`, `amsmath`, `epstopdf`, `url`, `hyperref` and `enumerate`. In the preamble you also put the title, author and date that will be printed when you execute `\maketitle`.

Making a twocolumn format is really easy: `\documentclass[11pt,twocolumn]{article}`.

Using “`url{http: ...}`” will insert the url in a different font with an active link i, while “`\href{http: ...}{text}`” will make the text hot linked to the url. Note that the keyboard double quote ” is NOT the way to get open and close quotes.

1 This is the first section, text.

One of the powerful things about \LaTeX{} is that it does the numbering for you of all section, equations, lists, ...

Text is relatively simple. Just type the stuff.

Include a blank line to force a new paragraph. Now there are some things that we want in text such as bold face items, items in italics, or typewrite font.

1.1 You can also have Subsections

1.1.1 And subsubsections

Lists are useful. Sometimes we just want to produce a numbered list:

1. This one has two items, the first
2. and the second.
Sometimes we want a “numbered list” that uses other symbols.

(a) such as letters
(b) for the
(c) different items

Sometimes we want bulleted lists

• since the items are not
• in any particular
• order

We can nest lists up to four levels

1. With sub lists having the same
   (a) type of list
   (b) in this case enumerated—note that
      the symbol changes automatically
   (c) By the way to produce the long
      dash, — (an em-dash) you type
      three en-dashes, these -, in a row.
      Two en-dashes in a row produce a
      minus sign, –.

2. or sublists of
   • different types
   • such as an itemized list

The other list type is Description, useful for definitions.

Monday’s child is full of woe.

Tuesday’s child had something that rhymed with woe, can’t remember what

It is convenient to produce footnotes and this is relatively easy\footnote{See it just appears here, and you don’t even need to keep track of the number.}. Again \TeX{} keeps track of the numbering\footnote{Again \TeX{} keeps track of the table numbers. Tables (and figures) can be located “h = here”, where the code is written, or a the “t = top, b = bottom” of the page, or at the end of the document, “p”.

<table>
<thead>
<tr>
<th>Planet</th>
<th>Mass (terran masses)</th>
<th>Radius</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mars</td>
<td>0.107</td>
<td>0.530</td>
</tr>
</tbody>
</table>

Table 1: Here is a nice table, using a Table environment that encloses a Tabular environment. The table number is generated automatically. This table is labeled Astro so we can reference it subsequently.

If a table or an equation is really long it can be forced to span two columns. I’ll let you try to find that on the web.

One of the nice features of \TeX{} is that it automatically keeps track of numbers of sections, tables, equations, and figures. Then if you revise a document and insert a table before Table\footnote{The tables will be renumbered. In referencing a table, or equation, or section, we use a label (such as Astro) and a \texttt{\ref} command. The code must be compiled twice to get the numbers to work.} the tables will be renumbered.

In referencing a table, or equation, or section, we use a label (such as Astro) and a \texttt{\ref} command. The code must be compiled twice to get the numbers to work.

2 Math commands

This will just be a brief intro. One of the reasons \TeX{} was invented was to make lay-

\footnote{Here is my second footnote.}
out of mathematics precise and pretty. Math entities are done in the math environment. We can use two $ to enclose a brief inline statement such as a variable name, \( x, t, \theta \) or simple expression, \( c = \sqrt{c_x^2 + c_y^2 + c_z^2} \).

For an unnumbered equation on a separate line, use a pair of double dollar signs, “$$”, to suppress the number such as

\[
x = \frac{2c}{-b \mp \sqrt{b^2 - 4ac}}
\]

The last, unnumbered equation is, incidently, another way to find solutions to a quadratic \( ax^2 + bx + c = 0 \).

We can use the Equation environment to produce an equation on a separate line,

\[
x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
\]

Greek letters are easy to put into math expressions, simply use \( \backslash \) and the name of the letter, gamma for lower case, \( \gamma \), Gamma for upper case \( \Gamma \).

Refer to http://garsia.math.yorku.ca/MPWP/LATEXmath/latexsym.html for a list of symbols.

Superscripts and subscripts are easy, use an underscore, _, for subscript and a caret, ^, for superscript. If the subscript has more than one character, such as \( v_{initial}^{1/2} \), the characters must be enclosed in { and }.

Making vectors and unit vectors is easy, \( \vec{v} = 5.0\hat{i} - 3.0\hat{j} \), while making matrices is harder and requires a combination of parentheses that resize, \( ( \), and an array, all enclosed in

\[
\begin{pmatrix}
\hat{i} & \hat{j} & \hat{k} \\
5 & 6 & -2 \\
4 & 3 & -7 \\
\end{pmatrix}
\]

There are plenty of things in \LaTeX that go beyond what is covered here. Dr. Hollenbeck, Dr. Barton, and I have been doing a considerable amount of \LaTeX so feel free to ask any of us.

So now dazzle me with some complicated equation from courses you have taken—i.e add an equation of some complexity that you have used in previous physics or mathematics courses.

Your equation here \ldots

\[
\text{(3)}
\]