

1 What is LaTeX?

LaTeX is a typesetting system. Unlike most word processors, where what you write is exactly what appears on your document, in LaTeX you write your source text separately. Instead of manually formatting your document, in LaTeX many formatting details are standardized and taken care of automatically, and the focus is placed on content. In addition, LaTeX works more like code in that there are many commands by which you can insert characters, format equations, work with images and graphics, and much more. You can even define your own commands to carry out more specialized functions, much like a programming language.

2 Getting Started

You can download LaTeX software on to your computer, but we've found the simplest way to start using LaTeX is to use www.overleaf.com. You can create a free account and start making new projects right away.

Once you open a new project, you will see three areas on your screen. The leftmost area is where you see your files; for the most part there is nothing to do there unless you need to add images, in which case simply press the upload button at the top and add in files from your computer. In the center you see the source file, which is where you write your document in LaTeX. Finally, on the right is the final, compiled document, which is what your final product will look like. Make sure you press the green Recompile button to update the right side periodically, and before you need to download your file.

When you are done writing the document, press the Menu button in the top right corner to download your file(s). In general, for submissions you will only need the PDF file representing your compiled work. The source file contains the LaTeX code you wrote in case you want to edit it elsewhere.

3 CS22 Template

`http://cs.brown.edu/courses/csci0220/static/files/documents/templates/template.tex`

The TAs have provided a handy LaTeX template that is already set up for you to use! When you first start editing a file, you can use this template to set up your document. It includes packages that may be useful, presets for margins and page style, and an outline for your work. However, the template is totally optional, and feel free to change whatever you need to.

When you open the template, you'll see the Preamble, containing the following sections titled: "Document Class and Packages", "Various Housekeeping",

“Assignment Information”, “Header”, and “Custom Things”. The Preamble essentially formats the document and defines all the tools that will be available for you to use throughout the file.

1. Document Class and Packages:

Imports any packages you will need in the document. Some additional packages you may choose to use are `graphicx` (to import images) and `tikz` (to draw diagrams). Documentation on how to use these packages can be found here:

https://www.overleaf.com/learn/latex/Inserting_Images

https://www.overleaf.com/learn/latex/TikZ_package

2. Various Housekeeping:

Sets the margin length, font style and size, and various indentation. You do not have to modify this section.

3. Assignment Information:

Sets up the front page of the document, which contains the course name, year, and the homework number. You should update the homework number accordingly for each assignment.

4. Header:

Sets up the header for each page. You do not have to modify this section.

5. Custom Things:

Here you can customize your own shortcuts to commands you use often. It contains some that we think might come in handy commented out, but you can create your own by typing:

```
\newcommand{[your shortcut]}{[actual command]}
```

After the Preamble is the Document, where your homework answers will go! The first problem is set up for you. Start writing your answer between the lines `\begin{answer}{1}` and `\end{answer}`.

4 Common LaTeX Symbols

Here is a link to the shortcuts for many common LaTeX symbols you'll use in CS22: <https://artofproblemsolving.com/wiki/index.php/LaTeX:Symbols>

5 LaTeX Techniques

5.1 Environments

Environments are areas of text that have the `\begin` and `\end` tags.

- Document: The document should start with `\begin{document}` and end with `\end{document}`. Any code outside of these tags will cause compiling errors.
- Answer: Your answer to each question should be between the `\begin{answer}{x}` and `\end{answer}`, and the begin tag should specify the problem number.
- Itemize: You can create bullet points by using `\begin{itemize}` and `\end{itemize}`. You can represent each bullet by typing `\item` in the environment.

```
\begin{itemize}
  \item My first bullet
\end{itemize}
```

- Enumerate: You can number sub-parts of a problem using `\begin{enumerate}` and `\end{enumerate}`. The default setting is 1., 2., 3..., but you can modify it by adding `[a.]` or `[(i)]` to the begin tag. You can represent each part by typing `\item` in the environment.

```
\begin{enumerate}[a.]
  \item Here's part a!
\end{enumerate}
```

5.2 Math Mode and Equations

In your CS22 homework, you'll be writing many equations and mathematical expressions to show calculations and support your proofs. To do this, you'll need to know how to use math mode, along with some other useful features. To start using math mode, use a `$`, write whatever you need to, and then close with another `$`. It's very important to include the closing `$`, as not doing so will cause errors.

As an example, here's what your source and output might look like using math mode:

Here's an equation! $e^{i\pi} + 1 = 0$

Here's an equation! $e^{i\pi} + 1 = 0$

Another way to write an equation is to use an environment and bracket it with `\begin{equation}` and `\end{equation}`. This will also number your equations for you, and if you want to omit one from the numbering scheme, use `equation*` instead of `equation` within the brackets. For example,

```
\begin{equation}
  a + 4b + 6c + 12d = 90
\end{equation}
```

$$a + 4b + 6c + 12d = 90 \tag{1}$$

Finally, a third useful way to write equations is with the `align` environment. This is especially useful if you are trying to show a solution or simplification that takes multiple lines of calculation. In `align`, the `&` sign aligns multiple lines together at the same horizontal point; make sure to use the double-backslash newline symbol between lines. Again, use `align*` to omit numbering if desired. An example is provided below:

```
\begin{align*}
  a &= \int_0^1 x^2 dx \\
  &= \left. \frac{x^3}{3} \right|_0^1 \\
  &= \frac{1}{3} - 0 \\
  a &= \frac{1}{3}
\end{align*}
```

$$\begin{aligned}
 a &= \int_0^1 x^2 dx \\
 &= \left. \frac{x^3}{3} \right|_0^1 \\
 &= \frac{1}{3} - 0 \\
 a &= \frac{1}{3}
 \end{aligned}$$

5.3 Commenting

If you want to annotate your LaTeX code, or are getting a compiling error, you can comment code out using this symbol: `%`. This keeps the text in your source file, but won't reveal it in your compiled document. Note that `%` only comments out anything to the right of the symbol, so if you use it in the middle of a line, you will still see any code written before it in that line.

You can quickly comment and uncomment lines by highlighting and typing `Command/` (on a Mac) or `Control/` (on a Windows).