CAM REU 2019: LaTeX Tutorial

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1. Why LaTeX?
   (a) Examples: LaTeX versus ... other stuff
   (b) LaTeX is the industry standard for mathematicians. You will use it to write assignments, tests, research papers, books, your thesis!
2. How do I get it?
   (a) Local versions: download at `https://www.latex-project.org/get/`
   (b) Online versions: Overleaf, ShareLaTeX, others (online versions are good for collaborating)
3. The basics of document structure
   (a) The header
      - `\documentclass[12pt]{article}`
      - `\title{}, \author{}, \date{}`
        `\maketitle`
   (b) Packages
      - `\usepackage{amstools,amsmath,graphicx}`
   (c) Comments. The % sign for making comments, and
      `\%`
   (d) Beginning and ending
      - `\begin{document}, \end{document}`
      - In general, many commands will take this form, that is
        `\begin{blah} \end{blah}`

- Compiling

4. Formatting and organizing text
   (a) Sections and subsections (numbered and non-numbered)
   (b) Text styles
      - **Bold**:
        `{\bf Bold}`
      - *Italic*:
        `{\em Italic}`
      - Underline:
        `\underline{Underline}`
   (c) Lists
      - Itemize
        `\begin{itemize}`
        `\item`
        `\end{itemize}`
      - Enumerate
        `\begin{enumerate}`
        `\item`
        `\end{enumerate}`
      - You can nest them (as I have done excessively in this document)!
   (d) Spacing
      - `\begin{center}, \end{center}`
      - `\hspace{2in}`
      - `\vspace{2in}`
      - `\noindent`

5. Math
   (a) Math mode (inline)

```
This puts $x+1=4$ right in the sentence.
```

(b) Math mode (display)

```
\[ x+1=4 \]
```

(c) Equation (numbered and not)

```
\begin{equation} x+1=4 \end{equation}
```

and

```
\begin{equation*} x+1=4 \end{equation*}
```

(d) Align (numbered and not)

```
\begin{align} x+1 &= 4, x+y &= 7 \end{align}
```

(e) Referencing equations in text:

```
\begin{equation} x+1 = 4 \label{eqn:favorite}  \end{equation}
```

In the text, you can point to it:

```
My favorite equation is shown in Equation \ref{eqn:favorite}.
```

(f) Good symbols to know in math mode (a non-exhaustive list):

- subscript
  `x_0, A_{ij}`
- superscript
  `x^2, A^{m\times n}`
- `\sqrt{x}`
- `\pi`
- `\infty`
- fractions
  `\frac{\partial u}{\partial x}`
- integrals
  `\int xdx, \int_0^1 xdx`
- sums
  `\sum i, \sum_{i=1}^N i`
- trig:
  `\sin(x), \cos(x),\tan(x)`
- bold (e.g. $\mathbb{R}$, real numbers)

```
\mathbb{R}
```

- calligraphy (e.g. $\mathcal{O}$, big-o notation)

  ```
  \mathcal{O}
  ```

- matrices

  ```
  \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}
  ```

- properly sized parentheses

  ```
  \left( \right)
  ```

6. Figures and Tables

   (a) Figures (should be in same folder, or point to correct directory)

   ```
   \begin{figure}[htb]

   \begin{centering}

   \includegraphics[width=2in,height=3in]{filename.eps}

   \caption {This is the caption for my figure.}

   \label{fig:goodfigure}

   \end{centering}

   \end{figure}
   ```

   (b) Tables

   ```
   \begin{table}

   \caption{Example table}

   \centering

   \begin{tabular}{llr}

   \toprule

   First name & Last Name & Grade \\

   \midrule

   John & Doe & $7.5$ \\
   ```

```
Richard & Miles & $2$ \\

\bottomrule

\end{tabular}

\label{table:grades}

\end{table}
```

7. Citations and bibliography

   (a) The easiest way is to create a .bib file.

```
@article{mycitationkey,
 title={My Article Title: A Novel Approach},
 author={Lastname, Author and Doe, Jane G},
 journal={Journal of Excellent Research},
 volume = {82},
 issue = {1},
 pages = {209--212}
 year={2019}
}
```

   (b) Create the bibliography in your file:

```
\bibliographystyle{plain}

\bibliography{/home/heather/research/references}
```