07-131

Great Practical Ideas in Computer Science

Lecture 1: intro + latex by Laura Yao and Jules Yang

Pet tax (this is not my pet.. But one day...)


Course Introduction
A
B
C

Tom & Veronica

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vpeet@andrew.cmu.edu

TA Introductions

Jules Yang (she/her)

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OH: Fridays @ 1:45 pm

- CS Senior
- HCI concentration, Physical Computing prospective minor
- Hobbies: lifting, making Spotify playlists, cooking

Laura Yao (she/her)

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OH: Fridays @ 11am

- CS Junior
- Language Tech Concentration
- Hobbies: singing, taking walks

Kavya Tummalapalli (she/her)

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OH: ____ @ __:__am

- CS Senior
- Graphics & HCI Concentrations
- Hobbies: running, dancing, crafting/diy

Sarah Chen (she/her)

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OH: Wednesdays @ 10:30am

- CS Junior
- Science, Tech, and Society Minor
- Hobbies: traveling, hiking, tennis, driving

Tika Naik (she/her)

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OH: Saturdays @ 10am

- CS Junior
- Innovation and Entrepreneurship minor
- Hobbies: hiking, reading, bullet journaling

Lucy Mo (she/her)

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OH: not sure yet

- AI sophomore
- Language Tech Concentration
- Hobbies: snowboarding, violin, making waffles

Maggie Cai (she/her)

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OH: Saturday @ 11am, Gates Carrel 3

- CS Sophomore
- Comp Finance Minor
- Hobbies: tennis, cooking, art

Daphne Han (she/her)

daphnehan@cmu.edu
OH: Mondays @ 5PM

- Computational Biology Sophomore
- Design for Learning minor
- Hobbies: calligraphy, bullet journalling, consuming lots of coffee & tea, taking selfies (@daphtakesselfies??)

Alvaro Luque (he/him)

aluque@andrew.cmu.edu

OH: Wednesdays @ 12:00pm

- CS Sophomore
- AI Concentration, neural computation minor
- Hobbies: Playing guitar, Longboarding, Gym, Cooking

Kyle Booker (he/him)

kbooker@andrew.cmu.edu

OH: Mondays @ 4:00pm, Gates Commons Table 4

- CS Sophomore
- Minor/Concentration unknown 👀
- Hobbies: I play music through independent musicians org.

Len Huang (he/him)

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OH: Monday @ 7pm, Gates Carrel 3

- CS Senior
- Economics Minor
- Hobbies: Lifting, Track & Field, Basketball, Guitar

Steven Wu (he/him)

stevenwu@andrew.cmu.edu
OH: Tuesday @ 5pm, Gates Carrel 4

- CS Senior
- Robotics Concentration, Entrepreneurship Minor
- Hobbies: Climbing, freestyle rap, foosball

Jes Dai (she/her)

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OH: Sundays @ 4 pm

- CS Sophomore
- SWE prospective minor
- Hobbies: making jewelry,
- drawing, decorating things, jpop

Deepti Sunkara (she/her)

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OH: Thursdays @ 3pm

- CS Senior
- HCI concentration
- Hobbies: writing fiction, DIY crafts

GOALS

- To teach you about all the awesome things you can do with your computer.
- To make you super comfortable using Unix systems and the tools you'll use in future courses
- ...and in future internships
- To be a break from your other classes

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CMU CS IS...
NON TRIVIAL

Class Time

- < 20 minute lectures (usually)
- Work on the labs with TA help!
- Labs are due in a week, but most people finish in class!

Labs

- Mostly unix interactive themed puzzles!
- Distributed through git (except the lab today)
- Each lab is released at class time
- Submitted on autolab AUTØLAB
- Late policy: 40 late days!

Collaboration Policy

You may:

- use manual (man) pages for commands in question.
- use Google to learn how to use a command/solve a problem.
- ask TAs for help.
- post on Piazza
- ask neighbors for conceptual clarifications

You may not:

- Ask your neighbor how to do the (entire) lab

Exams

- TBD: Will let you know as we approach them
- They are during class time
- One midterm and a comprehensive final
- Forecasted dates:
  - Midterm 10/5
  - Final 12/7

Extratations

- Extra lectures on weekends about miscellaneous topics
- Room and times will be posted on Piazza.
  - Most likely Saturdays at 1-2pm, however please check Piazza!
  - May be online or in-person
- If you attend at least three extratations, you can use your midterm grade as your final grade (or vice versa). This means you can get out of taking an extra final!

Grading

- 80% labs (...which will be done in class)
  - Each lab includes several tasks
  - Complete all tasks to receive full points
  - No late work penalty, but must let us know beforehand!
    - Hard deadlines: before midterm and before final
- 10% midterm
- 10% final

Do the assignments!

- There will be around 8 assignments with equal weight, so each assignment is 10% of your total grade

Getting Help

- Ask TA or neighbor during lecture time
- Post on Piazza
- Course Website (Coming soon)
- Office hours - we don't bite!
  - OH calendar link: tinyurl.com/f22-gpi-oh

QUESTIONS?

Autolab tour


LATEX
The only typesetting program you need.
A
B
C

01

INSTALLATION

02

WRITING MATH

03

WRITING CODE

04

MACRO MAGIC


INSTALLATION

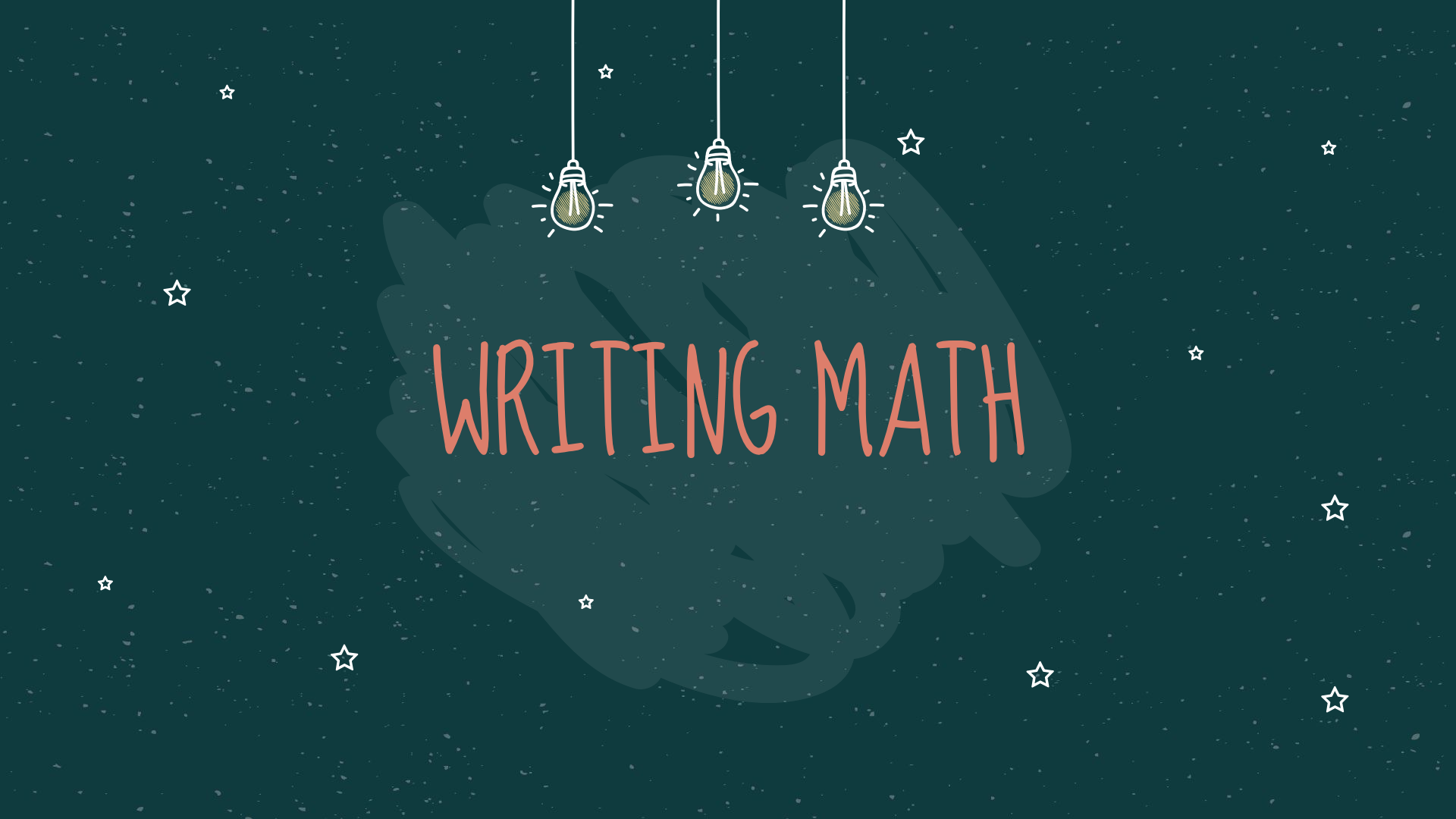
TWO SCHOOLS OF THOUGHT

OVERLEAF

- An online LaTeX editor
- Grab and go
- Chrome + Overleaf = 😈
- Need to be online
- Awesome for collaboration

LOCAL

- Edit using your favorite IDE
- Might be a pain to setup
- Much better performance
- Can do homework on a plane
- Need to use **`git`** or Live Share


WRITING MATH

Latex basics

```
\documentclass{article}

\usepackage{...}
\newcommand{...}
\author{...}

\begin{document}

% most of your stuff goes here
% in between \begin{document}...\end{document}

\end{document}
```

preamble

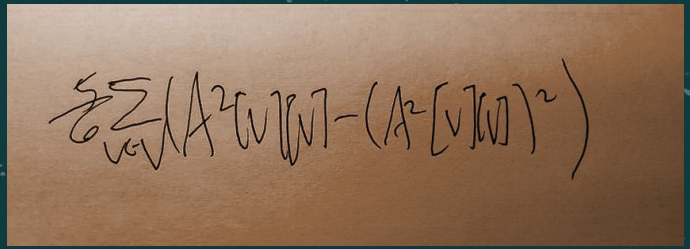
Import packages if needed

Defining your own commands, code styles, embedding your name, andrew, id, etc, etc.

Everything inside \begin{document}...\end{document} is what will actually be rendered

I WANNA MAKE MATH PRETTY

LaTeX's main purpose is to make typesetting easy for technical and scientific documents, most often math (e.g. **15-151 bonus**).



```
(5/6)(sum v in V (A^2[v][v] - (A^2[v][v])^2))
```

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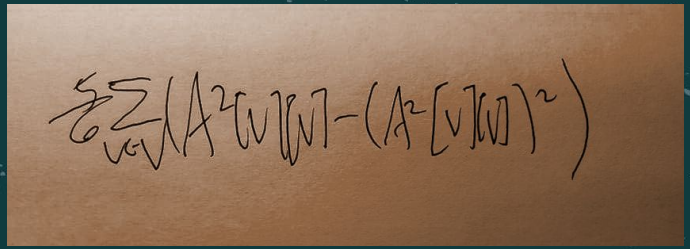

```
(5/6)(sum v in V (A^2[v][v] - (A^2[v][v])^2))
```

$$\frac{5}{6}\sum_{v\in V}\left(A^2[v][v]-\left(A^2[v][v]\right)^2\right)$$

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Modes

Math has to be written within a "math-mode" to differentiate from regular text.

a. **Inline:** Write math-formatted text inline
   i. `$\frac{x + y}{12}$`
b. **Labeled Equation:** Centered equation on newline
   i. `\begin{equation} \label{ezmath} 1 + 1 = 2 \end{equation}`
   ii. Labels can later be linked to: `\hyperref[ezmath]{yourDisplayTextHere}`
c. **Unlabeled Equation:** Centered equation on newline
   i. `\[ 1 + 1 = 2 \]`

BUT I RAN OUT OF SPACE

Alignment

Math can be split over multiple lines and better styled with alignment;

- `&` is the alignment keyword and sets the points where equations are vertically aligned
- **Numbered Equation:** Centered equations aligned at `&`
  - `\begin{align} a &= b\\ &= c \end{align}`
  - **Protip:** You can suppress the line numbers with `\begin{align*}` instead
  - **Protip:** Use `\tag{...}` to cite your lines!
- **Multline Equation:** Centered equations with no alignment points
  - e.g. `\begin{multline} a + b + c + d\\ e + f + g + h\end{multline}`
- `~` for space in math mode

`\usepackage{amsmath}`

🚨 ALWAYS close any `\begin{...}` with an `\end{...}` 🚨

USEFUL FEATURES

EQUATIONS

- `\begin{equation}`
  `...`
  `\end{equation}`
- More:
  - `\begin{multline*}`
  - `\begin{align*}`
  - `\begin{gather*}`
  - `\begin{cases}`

MATRICES

- ```
  \begin{matrix}
  1 & 2 & 3\\
  4 & 5 & 6
  \end{matrix}
  ```
- More:
  - `pmatrix`, `bmatrix`, `Bmatrix`, `vmatrix`, `Vmatrix`

PROOFS

- `\newtheorem{...}`
- `\begin{proof}...\end{proof}`
- More:
  - Induction (templated)
  - QED stylings (templated)

RELATION & BINARY OPERATORS

- General
  - `+`, `-`, `\div`, `\times`, `\pm`, `\ge`, `\geq`
- Trigonometric
  - `\sin`, `\cos`, `\tan`
- Set
  - `\in`, `\subset`, `\subseteq`
- Calculus (templated)

LETTERS & SYMBOLS

- Greek letters
  - `\SYMBOL_NAME` (e.g. `\mu`)
- Arrows
  - `\DIR_ARROW` (e.g. `\rightarrow`)
- `\infty`, `\nabla`, `\emptyset`, `\neg`

PROBABILITY

- `$P(A \binom B)$` → $P(A \binom B)$
- `\binom{n}{k}`
- `\bar`
- `\hat`
- `A \perp B`
- Probability, combinations, expectation, variance (templated)
  ```

DON'T FALL INTO A PIT

Quotations

- ✅ Two backticks start, two single quotations end: ``` ``...'' ```
- 🚫 This will not work: ```"..."```

Math Mode

- 🚫 `$$...$$` is no longer supported by LaTeX
- ✅Use `\[...\]` instead.

Parentheses

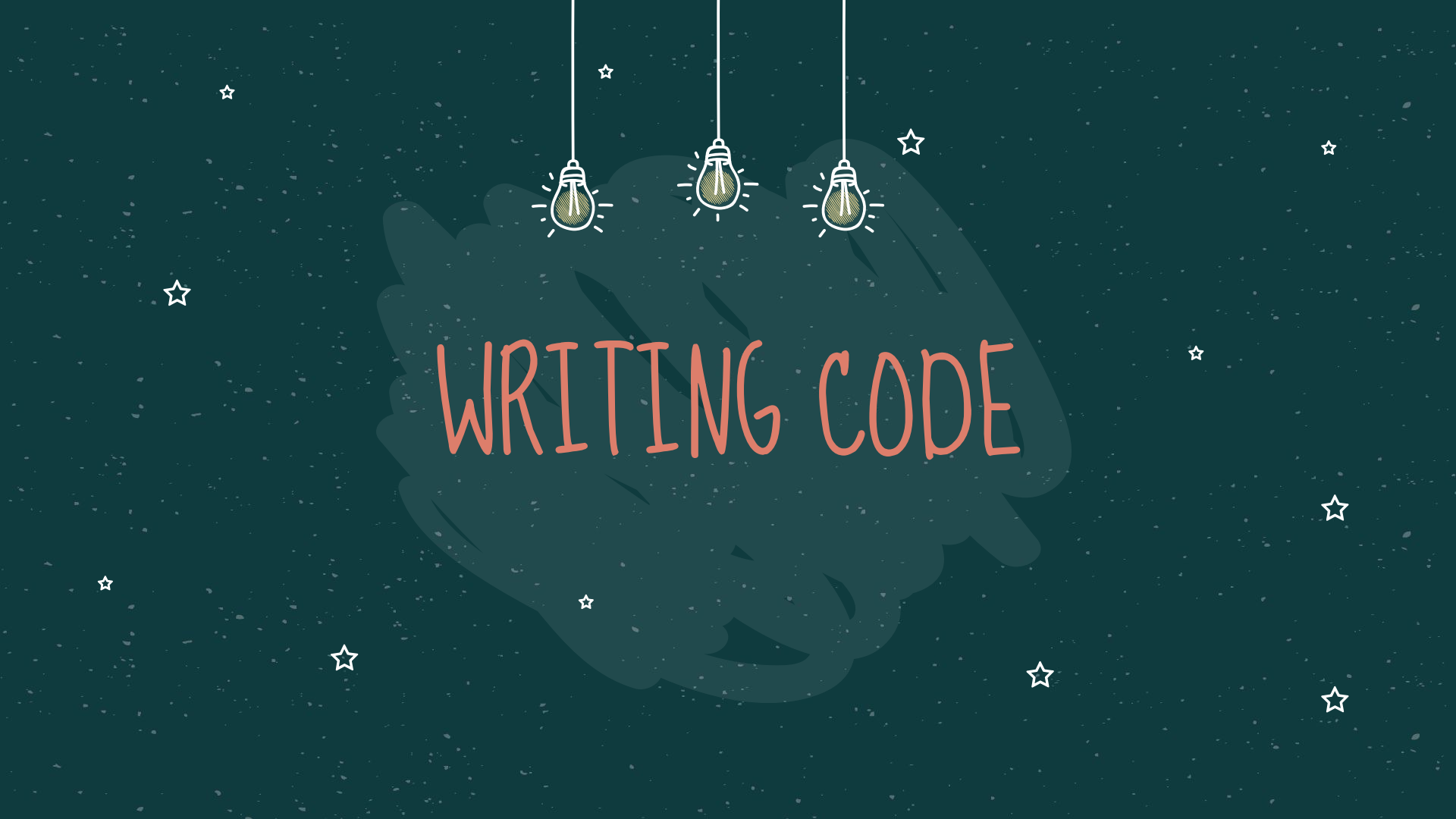
- 🚫 Do not use parenthesis like `(5 * f(x))`
- ✅Instead use `\left(` and `\right)` every time for correct sizing

Special Characters

- When using the letter L as a variable name, use `\ell` so it looks like ℓ instead of *l*
- A number of special characters exist in LaTeX. To show up in output, the character must be escaped:
  - `&`, `%`, `$`, `#`, `_`, `{`, `}` → `\&`, `\%`, `\$`, `\_`, `\#`, `\{`, `\}`
  - `~`, `^`, `\` → `\textasciitilde`, `\textasciicircum`, `\textbackslash`

Newline

- `\\` should NOT be used for text newlines
  - This command has different meanings under different environments. Be explicit with using `\newline`, `\linebreak`, or `\par` instead.
  - `\\` is usually used for alignment or line break *inside* modes like align, matrix, etc


WRITING CODE

BUT MACKEY, I JUST WANNA CODE

VERBATIM

It's the 1980s guys. People have **typewriters**.
With LaTeX, you have typewriters on your computer:

- `\begin{verbatim}...\end{verbatim}`
- Will type out exactly what you type in, as if you were writing on a typewriter
- By default will turn text into monospace text (i.e. code style)

Special commands:

- Emphasize whitespace
  - ```
    \begin{verbatim*}
    ...
    \end{verbatim*}
    ```
- Verbatim environment
  - `\verb|...|`

LISTINGS

`\usepackage{listings}`

Aight LaTeX moved to the **21st century** now.
Way more bells and whistles to play around with:

- ```
  \begin{lstlisting}[options=...]
  ...
  \end{lstlisting}
  ```
- Will also create monospace text, but way more configuration options:
  - **Language:** `[options]`
  - **Syntax highlighting:**
    - `[keywordstyle, stringstyle, commentstyle, morecomment]`

Special commands:

- Listings environment inline
  - `\lstinline{...}`
- Import code from file
  - `\begin{lstlisting}{path_to_file}`


MACRO MAGIC

FACTS OF LIFE

LaTeX is noice.

- It makes math look pretty.
- You can type complicated symbols.
- It makes code look pretty.

LaTeX is a good to know.

- You get bonus points in 15-151.
- Pretty is better than ugly.

LaTeX is a need to know.

- Some classes will require your homework to be typeset.
- Some classes will require your homework to be typeset. x2
- Conferences will require a .tex source of your paper.
- Collaboration on large papers for non-LaTeX mediums is almost impossible.

BUT AT WHAT COST?

- Everything has **tradeoffs**.
- Typesetting is **glorious** but **time-consuming**.
- But it doesn't have to be!
- You can create your **own commands** to template out commonly used things in your homework workflow for the rest of your college career.
- The sooner you start, the more time you'll save!

COMMAND CENTER

- `\newcommand{\NAME}[#]{...}`
  - `\newcommand{\R}{\mathbb{R}}`
  - `\newcommand{\dotseparated}[2]{#1 \cdot #2}`
- 🚨 Be cautious of whether your command will be used in math mode or not.
- You might need to use `\renewcommand` if a preexisting command has the same name.
- You can use these for titles, problems, common proof templates (induction), etc.
- In fact you can use our own LaTeX template for homeworks at CMU!!!

Closing Thoughts

- **Practice, Practice, Practice**
- Template
- LaTeX Cheat Sheet might be useful for lab ;);)
- Overleaf documentation
- Ask **Questions**
  - StackOverflow
  - LaTeX Community
- **Make** Things!

LAB PRO TIPS

- Please go through the writeup before starting this week!
- Each task has a header describing what you will do in the file!
- Remember to uncomment the task in main.tex to work on it!
- There may be hints at the bottom of each lab to help you along :)
- You can zip files together by highlighting them and right clicking
  You are handing in the final pdf **AND** the source tex files!!!
- You can rename a project in Overleaf by selecting the project, going to “More”, and then applying rename!
- The Makefile will only work if you have a LaTeX installation!

~~Extratation~~ Extended OH this weekend!

- Need preparation ahead of time for week 2: terminal!
  - Link to Initial Setup Tutorial - https://tinyurl.com/gpi-f22-setup
- Extended OH this weekend!
  - **Saturday @ 1:00 - 2:00pm in GHC Carrel 3 (subject to change)**
  - Come get help on set up or hangout with TAs~

Please give us feedback!

- Lecture pacing too slow/fast? Are there broken links or typos? Let us know through the feedback form!
- Link will also be available on the course website
- Form: tinyurl.com/f22-gpi-feedback

- Please go through the writeup on Autolab before starting this week!
- Each task has a header describing what you will do in the file!
- Remember to uncomment the task in main.tex to work on it!
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Set up + OH this weekend

- Link to Initial Setup Tutorial
- Extended OH this weekend! **Saturday @ 1:00 - 2:00pm in GHC Carrel 3 (check piazza)**

Feedback

- Form: tinyurl.com/f22-gpi-feedback

OH throughout the week!

- OH Calendar: tinyurl.com/f22-gpi-oh