


# **L<sup>A</sup>T<sub>E</sub>X Workshop**

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SUMS

October 24, 2023

UCSD



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## Society of Undergraduate Mathematics Students

### Upcoming Events

Date	Event	Time	Place
October 10th	Fall OGIM	5:15PM - 6:15PM	Natural Sciences Building Auditorium
October 13th	Board Game Night	5PM	APM 6402
October 18th	Careers in Finance w/ Rady	5PM - 6PM	APM 6402

### Purpose

SUMS, a UC San Diego student organization, provides resources, workshops, talks, and social events for UCSD's mathematics community with the goal of promoting mathematics and related fields.

[Join Our Discord Server](#)

[Subscribe to Our Newsletter](#)

### Info

- SUMS is holding its weekly board meetings every Tuesday from 5:00 - 6:00PM in APM 6402
  - If you wish to become a member please remember to sign in to events and meetings To learn more about becoming a member please click [here](#).
- Our events and activities are publicized on our newsletter, on Discord, and on flyers across campus.
  - Information, videos, and various resources can also be found for some of our past events.
- Links to our social media are located at the top-right. Our email is [sums@at.ucsd.edu](mailto:sums@at.ucsd.edu).

### Membership

To become a SUMS member, you must meet the following requirements:

- Be a registered UCSD undergraduate student(of any major)
- Attend and sign-in to at least 3 SUMS events and 3 SUMS board meetings within 90 days
- Submit a membership application after completing all the above requirements
- For more information click [here](#)

Board Meeting Sign-In

Event Sign-In

Submit Membership Application

# Table of contents

1. Introduction
2. The Fundamentals
3. Packages
4. Equations
5. Supplementaries
6. References

# What is $\text{\LaTeX}$ ?

## From the official website:

“ $\text{\LaTeX}$  is a high-quality typesetting system; it includes features designed for the production of technical and scientific documentation.  $\text{\LaTeX}$  is the de facto standard for the communication and publication of scientific documents.”

Notably for us, it can be used to convert a special programming-like language, called  $\text{\LaTeX}$ , into a PDF.

## $\text{\LaTeX}$ IDEs

$\text{\TeX}$ studio is an offline libre software (La) $\text{\TeX}$  suite. Overleaf (Student) is an online proprietary  $\text{\LaTeX}$  suite. pdf $\text{\TeX}$  is an offline libre software command line tool for converting (La) $\text{\TeX}$  into PDFs.

# Document Structure

```
\documentclass{article}  
\usepackage{amsmath}  
\begin{document}  
  \Large  
  Here is some text that will  
  printed onto the page  
\end{document}
```

Here is some text that will printed  
onto the page

# Commands and Environments

- Regular text
- Lists are a type of **environment**:
  - Items (Unordered) using `\begin{itemize}` .
  - Enumeration (Ordered) using `\begin{enumerate}`.
- You can pass two types of **arguments** to a **command**.
  - Required arguments in `{}`.
  - Optional arguments in `[]`.
- Commands that generate complex output:
  - Title, author, table of contents, bibliography, etc.

# Essential Math Packages

## AMS (American Mathematics Society)

**amsmath**: For math environments and formatting

**amssymb**: Various math symbols

**amsfonts**: Necessary font utilities (loaded by amssymb)

**amsthm**: Environments for proofs, definitions, theorems, etc. **tikz**:  
Used to draw images for math

## Other Fields

**physics**: Utilities for derivatives, vectors, etc.

**siunitx**: Allows expressing quantities in SI units

**braket**: Use for Bra-ket and set notation

**graphicx**: Allows inserting images into the document

# Equations

## Ways to insert equations

% Inline methods

This sentence has  $2+2$  words.

% Centered equations

$[f(x) = ax^2+bx+c]$  and  $f(x) = ax^2+bx+c$

% Full equations

$$f(x) = ax^2 + bx + c$$

$$f(x) = ax^2 + bx + c$$

## Two kinds of equation environments:

% This one numbers equations

$$f(x) = ax^2 + bx + c$$

% This one DOESN'T number equations

$$f(x) = ax^2 + bx + c$$



# Writing Equations

The BlackBoard Font to make  $\mathbb{N} \subset \mathbb{Z} \subset \mathbb{Q} \subset \mathbb{R} \subset \mathbb{C} \subset \mathbb{H}$ :

`\mathbb{N} \subset \mathbb{Z} \subset \mathbb{Q} \subset \mathbb{R} \subset \mathbb{C} \subset \mathbb{H}`

Superscripts, subscripts, left and right to make  $x_i^2$ :

`x_i^2`

Common commands like  $\sin$ ,  $\epsilon > 0$ ,  $\sum_{n=1}^{\infty}$ ,  $\lim_{\alpha \rightarrow \infty}$ ,  $\square$ :

`\sin, \cot, \sum_{n=1}^{\infty}, \lim_{n \rightarrow \infty}, \qed`

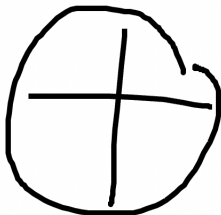
Common small environments  $\vec{x}$ ,  $i \neq j$ ,  $\bar{x}$ ,  $\boxed{\pi \notin \mathbb{Q}}$ :

`\vec{x}, i \neq j, \bar{x}, \boxed{\pi \notin \mathbb{Q}}`

## Detexify

classify

symbols



Score: 0.10724569905853899

`\oplus`  
mathmode



Score: 0.11888829626769593  
`\usepackage{ marvosym }`  
`\Celtcross`  
textmode



Score: 0.13584971423446138  
`\Theta`  
mathmode

<https://detexify.kirelabs.org/classify.html>

# Equation Exercises

Copy the following: Hint: Look things up and ask!

$$1) \quad -\frac{\hbar^2}{2m} \nabla^2 \psi + V(\mathbf{x})\psi = E\psi$$

$$2) \quad \Phi(x) = \frac{1}{1-x-x^2} = \sum_{n=0}^{\infty} F_n x^n$$

$$3) \quad {}^k a \equiv \underbrace{a^{a^{\cdot^a}}}_{k \text{ times}}$$

Challenge Problem:

$$4) \quad \mathbf{1}_{\mathbb{Q}}(x) = \begin{cases} 1 & x \in \mathbb{Q} \\ 0 & x \notin \mathbb{Q} \end{cases}$$

## Types of Wrappers

**matrix:** Default wrapper

**pmatrix:** Parenthesis wrapper

**bmatrix:** Brackets wrapper

**vmatrix:** Used for determinants

**Vmatrix:** Used for matrix norms

Use `&` for aligning elements and `\\` for switching lines, and use the `"\begin"` and `"\end"` clause to start the matrix environment.

$$\begin{array}{cc} 1 & 0 \\ 0 & 1 \end{array} \quad \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \quad \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

$$\left\{ \begin{array}{cc} 1 & 2 \\ 3 & 4 \end{array} \right\} \quad \left| \begin{array}{cc} 1 & 2 \\ 3 & 4 \end{array} \right| \quad \left\| \begin{array}{cc} 1 & 2 \\ 3 & 4 \end{array} \right\|$$

```
\begin{center}\begin{tabular}
      {c | c r l}
      ~ & R & P & S \\
      \hline \\
      R & 0,0 & -1,1 & 1,-1 \\
      P & 1,-1 & 0,0 & -1,1 \\
      S & -1,1 & 1,-1 & 0,0
\end{tabular}\end{center}
```

	R	P	S
R	0,0	-1,1	1,-1
P	1,-1	0,0	-1,1
S	-1,1	1,-1	0,0

# Matrix and Table Exercises

Copy the following: Hint: Look things up and ask!

$$1) \quad I_3 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$2) \quad x^T = (1 \quad 2 \quad \dots \quad n)$$

Number	Factors
12	1, 2, 3, 4, 6, 12
60	1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60

Challenge Problem:

My Tic-Tac-Toe		
X		
X	O	

# Tips and Tricks

Parameters and new commands:

```
\\[2*\\baselineskip]
```

```
\\newcommand{\\sline}{\\[0.5\\baselineskip]}
```

The no-break-space character:

```
\\LaTeX~'s best friend is \\TeX
```

```
\\~\\
```

Better differentials with **esdiff**:

```
\\diff[2]{y}{x}
```

Better inline fractions with **nicefrac**:

```
Put in paragraph $\\nicefrac{abc}{xyz}$.
```

Dummy text with **lipsum**:

```
\\lipsum[1][1] and \\lipsum[1-3]
```



# Enumerate

<code>\begin{enumerate}[(a)]</code>	
<code>\item Hello</code>	(a) Hello
<code>\item[1.] Hi</code>	1. Hi
<code>\item[i)] Hey</code>	i) Hey
<code>\item One</code>	
<code>\setcounter{enumi}{5}</code>	(b) One
<code>\item Hmm</code>	(f) Hmm
<code>\end{enumerate}</code>	

1. Overleaf LaTeX Documentation <https://www.overleaf.com/learn>