

For
Beginners!

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Some materials sourced from Eric Krause and Ron
Bannon



About Lipi

- Postdoc at NERSC
- Cornell BA 2015
- U. Chicago PhD 2021
- from Oregon
- SULI Alum
- Have worked at SLAC, Fermi lab, Argonne, and now Berkeley Lab!



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LATEX

Math mode

For inline math, use $\backslash(\dots\backslash)$ or $\$...\$$. For displayed math, use $\backslash[...\backslash]$ or $\backslashbegin{equation}$.

Superscript ^x	$\wedge\{x\}$	Subscript _x	$_ \{x\}$
$\frac{x}{y}$	$\frac{x}{y}$	$\sum_{k=1}^n$	$\sum_{k=1}^n$
$\sqrt[n]{x}$	$\sqrt[n]{x}$	$\prod_{k=1}^n$	$\prod_{k=1}^n$

Math-mode symbols

\leq	\geq	\neq	\approx
\times	\div	\pm	\cdot
\circ	\circ	\prime	\dots
∞	\neg	\wedge	\vee
\supset	\forall	\in	\rightarrow
\subset	\exists	\notin	\Rightarrow
\cup	\cap	$ $	\Leftrightarrow
\dot{a}	\hat{a}	\bar{a}	\tilde{a}
α	β	γ	δ
ϵ	ζ	η	ε
θ	ι	κ	ϑ
λ	μ	ν	ξ
π	ρ	σ	τ
υ	ϕ	χ	ψ
ω	Γ	Δ	Θ
Λ	Ξ	Π	Σ
Υ	Φ	Ψ	Ω

- Pronounced “lay-tech” or “la-tech”(does not rhyme with “paychecks”!)
- Document preparation tool:
 - Quick Formatting (and re-formatting)
 - Easy equations and symbols typesetting
 - Sophisticated figure management and tables creation
- Advantages:
 - FREE!
 - Used in most academic and professional settings
 - Creative freedom

<https://wch.github.io/latexsheet/>

How to Install L^AT_EX

All
distributions:



<https://www.latex-project.org/get/#tex-distributions>

Recommend



Have a university email address?
Use it!

Resources!

The Not So Short Introduction to $\text{\LaTeX} 2_{\epsilon}$

Or $\text{\LaTeX} 2_{\epsilon}$ in 139 minutes

by Tobias Oetiker

Hubert Partl, Irene Hyna and Elisabeth Schlegl

Version 6.3, March 26, 2018

<https://tobi.oetiker.ch/lshort/lshort.pdf>

Exercises available
here!
<http://m11.mathography.org/>

Some other useful
websites!

<https://wch.github.io/latexsheet/>

<https://www.tablesgenerator.com/>

<https://www.latex-tutorial.com/tutorials/>

A First Look at L^AT_EX

```
1 \documentclass[a4paper]{article}
2 \usepackage{amsmath}
3 \title{My First \LaTeX}
4 \author{Lipi Gupta}
5 \date{\today}
6
7 \begin{document}
8 \maketitle
9
10 % This is a comment!
11 \section{Introduction}
12 Hello, there! This is my paper.
13
14
15 \end{document}
```



My First L^AT_EX

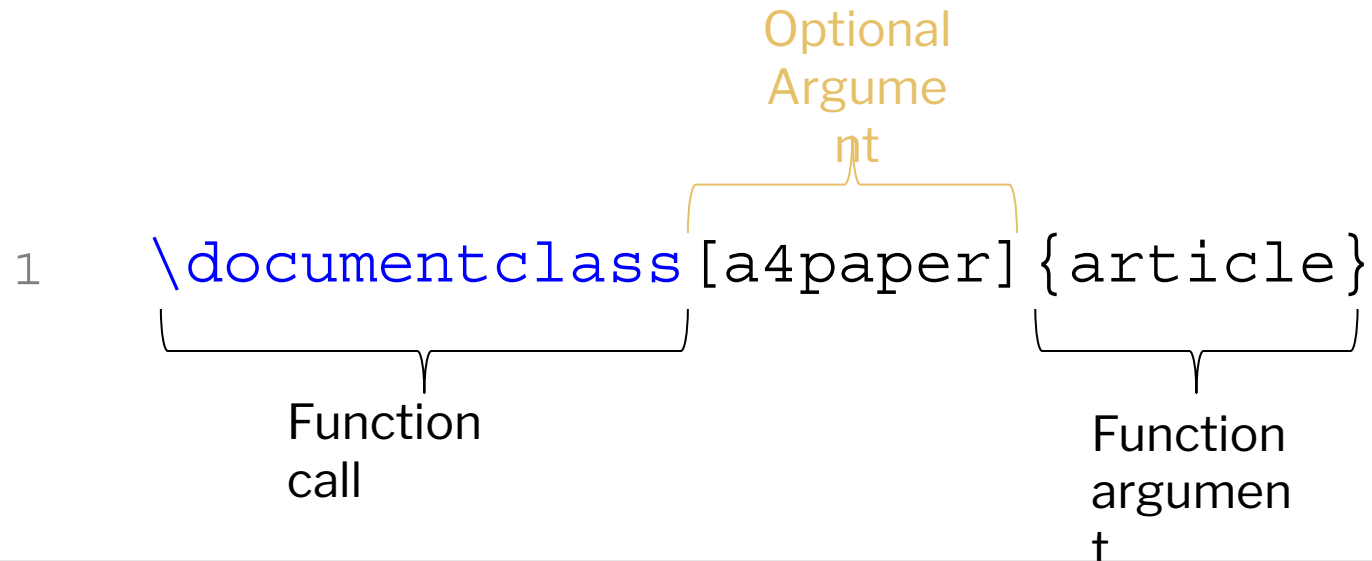
Lipi Gupta

July 31, 2014

1 Introduction

Hello, there! This is my paper.

Deciphering the “code”

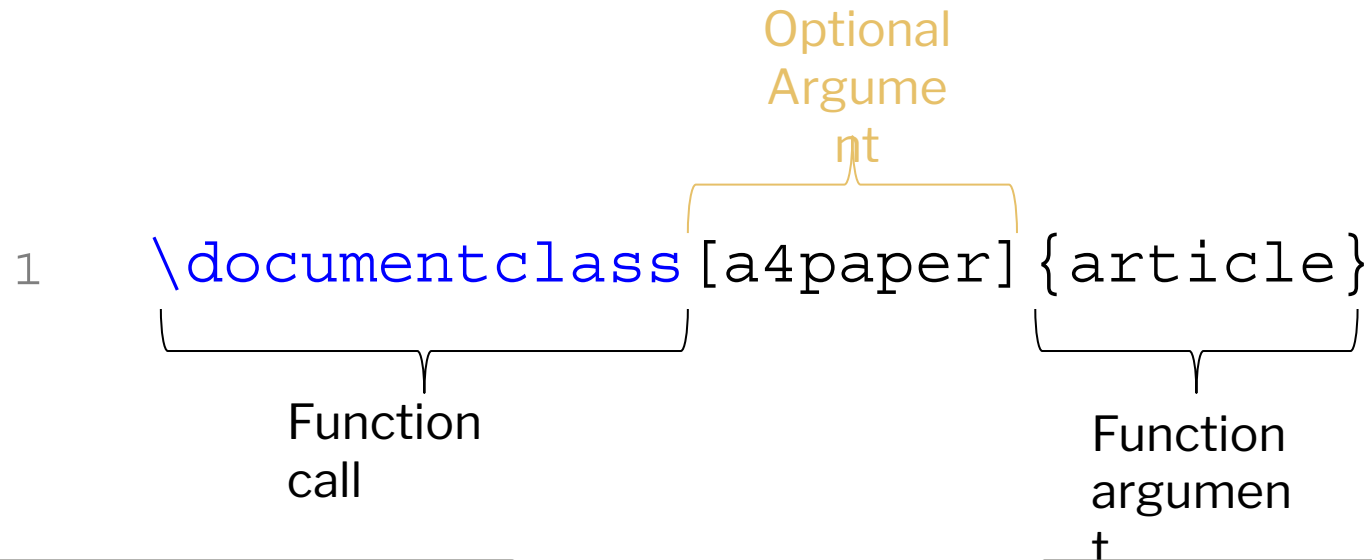


Familiar with python?

```
import latex as lx
lx.documentclass(article, paper_type = a4paper)
```

* this is a made-up line of code to make LaTeX seem familiar!

Deciphering the “code”



Some functions **with** arguments:

`\textit`{some words}

`\section`{some words}

`\frac`{x}{y}

Some functions **without** arguments:

`\today` `\Sum`

`\alpha`

`\chi` `\neq`

Using L^AT_EX

Symbol	Description	In order to use the actual symbol...
\	Escape character, function call	<code>\textbackslash</code>
{ }	Argument, group or separate functions	<code>\{ \}</code>
%	Comment	<code>\%</code>
\$	Enter/leave math mode	<code>\\$</code>
&	Alignment of columns	<code>\&</code>
$_$ [^]	Superscript/subscript in math mode	<code>_ \textasciicircum</code>
~	Insert unbreakable space	<code>\textasciitilde</code>

What are environments?

```
1  \documentclass[a4paper]{article}
2
3  \title{My First \LaTeX}
4  \author{Lipi Gupta}
5  \date{\today}
6
7  \begin{document}
8  My Grocery list:
9  \begin{enumerate}
10     \item apples
11     \item coffee
12     \item milk
13 \end{enumerate}
14
15 \end{document}
```

My Grocery list:

1. apples
2. coffee
3. milk

List Environments

```
1 \documentclass[a4paper]{article}
2
3 \title{My First \LaTeX}
4 \author{Lipi Gupta}
5 \date{\today}
6
7 \begin{document}
8 My Grocery list:
9 \begin{enumerate}
10 \item apples
11 \item coffee
12 \begin{enumerate}
13 \item hazelnut flavor
14 \item donut shop
15 \end{enumerate}
16 \item milk
17 \end{enumerate}
18 \end{document}
```

My Grocery list:

1. apples
2. coffee
 - (a) hazelnut flavor
 - (b) donut shop
3. milk

List Environments

```
1 \documentclass[a4paper]{article}
2
3 \title{My First \LaTeX}
4 \author{Lipi Gupta}
5 \date{\today}
6
7 \begin{document}
8 My Grocery list:
9 \begin{itemize}
10     \item apples
11     \item coffee
12         \begin{enumerate}
13             \item hazelnut flavor
14             \item donut shop
15         \end{enumerate}
16     \item milk
17 \end{itemize}
18 \end{document}
```

My Grocery list:

- apples
- coffee
 - 1. hazelnut flavor
 - 2. donut shop
- milk

Math Mode!

```
1 \begin{document}
2
3 \paragraph{Quadratic equations!}
4 Most quadratic polynomials look like:
5
6 \begin{equation}
7     P(x) = a x^2 + b x + c.
8     \label{eq:quadratic}
9 \end{equation}
10
11 The quadratic formula tells us the
12 roots of for Eq. \ref{eq:quadratic}:
13 \begin{equation}
14     x = \frac{-b \pm \sqrt{b^2 -
15 4ac}}{2a}
16 \end{equation}
17
18
19 \end{document}
```

Quadratic equations! Most quadratic polynomials look like:

$$P(x) = ax^2 + bx + c. \quad (1)$$

The quadratic formula tells us the roots of for Eq. 1:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad (2)$$

Math Mode!

```
1 \begin{document}
2
3 \paragraph{Quadratic equations!}
4 Most quadratic polynomials look
5 like:
6
7 \begin{equation}
8     P(x) = a x^2 + b x + c.
9     \label{eq:quadratic}
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12 The quadratic formula tells us the
13 roots of for Eq. \ref{eq:quadratic}:
14 \begin{equation}
15     x = \frac{-b \pm \sqrt{b^2 -
16 4ac}}{2a}
17 \end{equation}
18 where  $b^2 - 4ac$  is the
19 discriminant.
20
21 \end{document}
```

Quadratic equations! Most quadratic polynomials look like:

$$P(x) = ax^2 + bx + c. \quad (1)$$

The quadratic formula tells us the roots of for Eq. 1:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}, \quad (2)$$

where $b^2 - 4ac$ is the discriminant.

Some fancier stuff....

```
14 ▾ \begin{document}
15
16 ▾ \begin{equation}
17     e^{i\pi} = \cos(\pi) + i \sin(\pi) = -1
18 \end{equation}
19
20 ▾ \begin{equation*}
21     \sum_{n=0}^{\infty} \frac{x^n}{n!} = e^x
22 \end{equation*}
23
24 ▾ \begin{align}
25     S &= \begin{bmatrix}
26         x \\
27         p_x \\
28         y \\
29         p_y
30     \end{bmatrix}.
31 \end{align}
32
33 ▾ \begin{align}
34     2(q_1 + ab^2 q_2)xy &= 0 \\
35     q_2 &= \frac{-q_1}{ab^2}.
36 \end{align}
37
38 \end{document}
```

$$e^{i\pi} = \cos(\pi) + i \sin(\pi) = -1 \quad (1)$$

$$\sum_{n=0}^{\infty} \frac{x^n}{n!} = e^x$$

$$S = \begin{bmatrix} x \\ p_x \\ y \\ p_y \end{bmatrix}. \quad (2)$$

$$2(q_1 + ab^2 q_2)xy = 0 \quad (3)$$

$$q_2 = \frac{-q_1}{ab^2}. \quad (4)$$

Tables!

<https://www.latex-tutorial.com/tutorials/tables/>

```
1 \begin{document}
2
3 \begin{table} []
4 \centering
5 \begin{tabular}{cc}
6 Parameter & Value \\
7 \hline
8 a & 500 \text{m} \\
9 b & 100 \text{s} \\
10 \end{tabular}
11 \end{table}
12 \end{document}
```

Instructions about where the table should be placed**

How many columns and how are those elements justified within the column?

ccclll
(6 columns, first 3 are centered, last three are left-justified)

Line break

** see section 2.13 Floating Bodies
in Oetiker et. al.

Tables!

<https://www.latex-tutorial.com/tutorials/tables/>

```
1 \begin{document}
2
3 \begin{table} []
4 \caption{This is my first table!}
5 \begin{tabular}{cc}
6 Parameter & Value \\
7 \hline
8 a & 500 \text{m} \\
9 b & 100 \text{s} \\
10 \end{tabular}
11 \label{tab:first}
12 \end{table}
13
14 Please refer to table \ref{tab:first}
15
16
17
18 \end{document}
```

Table 1: This is my first table!

Parameter	Value
a	500 m
b	100 s

Please refer to Table 1.

<https://www.tablesgenerator.com/>

Figures!

```
1 \usepackage{graphicx}
2 \begin{figure} [h!]
3
4     \centering
5     \includegraphics[width = 0.7\textwidth]{mypicture.jpg}
6     \caption{The full lattice solution resulting in an identity transform matrix,
7 where  $a_1 = 2$  and  $b_1 = 3$ .}
8     \label{fig:pic}
9
10 \end{figure}
```

Reminder: the file name
should be a path to the image.
Think about how to keep this
organized!

`\listoffigures` and `\listoftables`

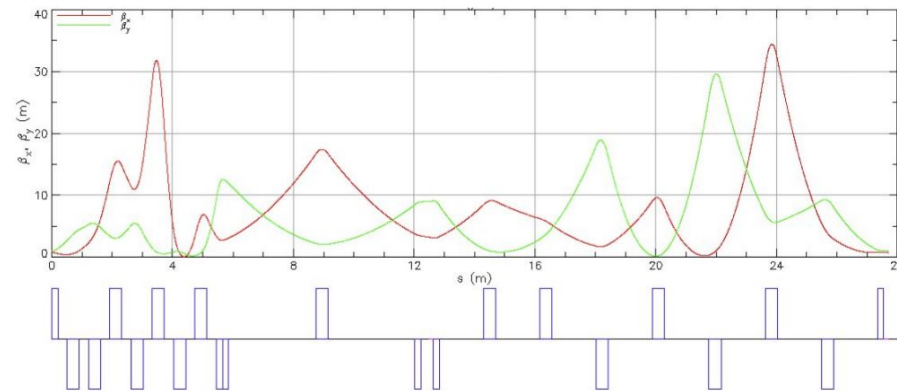


FIG. 3: The full lattice solution resulting in an identity transform matrix, where $a_1 = 2$ and $b_1 = 3$.

After considering these issues, it was prudent to reach out to the members of the CBB collaboration, in particular those interested in working on non-linear beam dynamics, to discuss another approach. Because we still hope to be able to set up an experiment to test this sextupole scheme, another method for designing a 1-D sextupole with greater control over certain parameters was needed.

Some random things

- Additional spaces between words are ignored.
- Manually add spaces by escaping a space ‘\ ’
- Line break: (no indent) two backslashes ‘\\’
- Paragraph break (indent) two newlines (‘Enter’ twice)