Hello LaTeX

An Introduction to the Typesetting Tool

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Date: September 23, 2022

Contents

1 Motivation

- High quality documents

- Automation

- Widely available and extraordinarily flexible

- Open-Source (and free)

- Enormous and extremely helpful user base

  - Overleaf guides
  - TeX Stack Exchange
  - CTAN - Comprehensive TeX Archive Network

- Nearly unlimited skillcap - actual benefits to improving

2 Base Packages

There are a few base packages that you should (almost) always import:

1. import

2. geometry

3. hyperref

4. amsmath

5. amsfonts

6. amssymb

7. inputenc

8. fontenc

9. biblatex

10. float

11. graphicx

...And a few that you'll typically include (and are used to prepare this document).

1. booktabs - Pretty professional tables

2. csvsimple - Simplify table generation

3. siunitx - Nice, clean, units

4. minted - Beautiful blocks of highlighted code thanks to Pygments

5. chemformula - Convenient chemical equation display

6. xcolor - Apply colours to words and stuff

```
1  \usepackage{import}
2  \usepackage{geometry}
3  \usepackage{hyperref}
4  \usepackage[tbtags]{amsmath}
5  \usepackage{amsfonts}
6  \usepackage{amssymb}
7  \usepackage[utf8]{inputenc}
8  \usepackage[T1]{fontenc}
9  \usepackage[style=ieee,backend=biber]{biblatex}
10 \usepackage{float}
11 \usepackage{graphicx}
12 \usepackage{booktabs}
13 \usepackage{csvsimple}
14 \usepackage{siunitx}
15 \usepackage{minted}
16 \usepackage{chemformula}
17 \usepackage{xcolor}
```

Listing 1: Code to include packages in a LATEXdocument (as used in this document)

3 Sections...

3.1 ...and subsections...

3.1.1 ...and subsubsections...

4 Equations

How about some equations?

$$\begin{aligned}
\delta &= -\frac{B^2}{180,000} + \frac{B}{173} + 0.5 \\
&= -\frac{533^2}{180,000} + \frac{533}{173} + 0.5 \\
&= 2.0
\end{aligned}$$

Or even a matrix

$$A = \begin{bmatrix} -\alpha_f - \beta_1 & 2 & \frac{1}{c} \\ -4i & \sqrt{5 - \alpha_f} & -6 \\ c & \beta_1 & 9 + i \end{bmatrix}$$

Calculus!

$$\frac{\mathrm{d}x}{\mathrm{d}t} = \sigma(y - x) \tag{1}$$

$$\frac{\mathrm{d}y}{\mathrm{d}t} = x(\rho - z) - y \tag{2}$$

$$\frac{\mathrm{d}z}{\mathrm{d}t} = xy - \beta z \tag{3}$$

An example with an integral, the Fourier Transform

$$\hat{f}(\xi) = \int_{-\infty}^{\infty} f(\xi)\, e^{2\pi i x \xi} \mathrm{d}\xi \tag{4}$$

5   Figures

You can add lovely figures, and then reference them like this "As stated in Figure 1". It's even a hyperlink *click* *click*
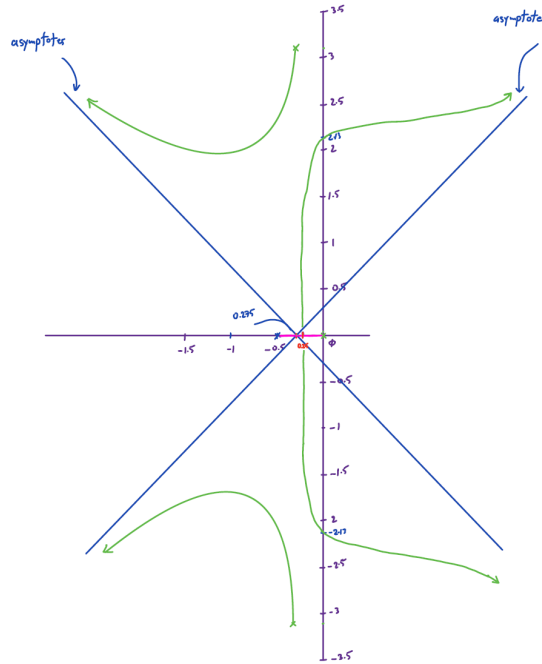

Figure 1: A test figure

6   Tables

What are tables like? Like this!

Table 1: Table of specified parameters and achieved values

Parameter	Target	Calculated	Simulated
NF_{dsb}	≤ 4	11.17	5.95
$IIP3$	≥ -22	≥ -2.73	-4.98
1 dB Compression	≥ -32	≥ -12.73	-14.2
Gain	≥ 16	≥ -3.26	-4.58
I_{bias}	-	-	-
I_{buf}	-	-	-
I_{ref}	-	1	1
R_D	≤ 10	570	600
V_{lo}	≤ 1	-	-
V_{rf}	≤ 1	-	-

7 Additional Helpful Packages

- siunitx I strongly recommend using the siunitx package for formatting all units.
  Hz
  100 nm to 200 nm
  100 kg
  Convenient!

- xcolor for colourful text!

- minted

```python
1   def string2bits(s=''):
2       return [bin(ord(x))[2:].zfill(8) for x in s]
3
4   def bits2string(b=None):
5       return ''.join([chr(int(x, 2)) for x in b])
6
7   s = 'Hello, World!'
8   b = string2bits(s)
9   s2 = bits2string(b)
10
11  print 'String:'
12  print s
13
14  print '\nList of Bits:'
15  for x in b:
16      print x
17
18  print '\nString:'
19  print s2
```

Listing 2: An example of a block of python included and highlighted with the package minted

- chemformula A chemistry (or nuclear) equation!

$$^{2}\text{H} + {}^{2}\text{H} \longrightarrow {}^{3}\text{He} + \text{n}^{0} \tag{5}$$

8 Bibliography

8.1 Writing the .bib File

```
1  @incollection{ref:01,
2  author = {Berger, M.J. and Hubbell, J.H. and Seltzer, S.M and Chang, J. and
   ↪  Coursey, J.S. and Sukumar, R. and Zucker, D.S. and Olsen, K.},
3  title = {XCOM Photon Cross Sections Database},
4  publisher = {NIST, PLM Radiation Physics Division},
5  year = {2010},
6  booktitle = {NIST Standard Reference Database 8 (XGAM)},
7  chapter = {Copper},
8  url = {https://physics.nist.gov/cgi-bin/Xcom/xcom8_1},
9  }
```

Listing 3: Code for a bibliographic entry

8.2 Using the References

Here I am making a statement that should be backed up with a reference placed right at the end. [1] Now it will show up in the bibliography and the reference above will link to it and be correctly numbered. For Free!

References

[1] M. Berger, J. Hubbell, S. Seltzer, *et al.*, "Xcom: Photon cross sections database," in *NIST Standard Reference Database 8 (XGAM)*, NIST, PLM, Radiation Physics Division, 2010, ch. Copper. [Online]. Available: `https://physics.nist.gov/cgi-bin/Xcom/xcom3_1`.