

# L<sup>A</sup>T<sub>E</sub>X Experiments

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## 1 TeX distributions

### 1.1 MacTeX

The best for Mac.

```
$ brew cask install mactex
```

### 1.2 Visual Studio Code LaTeX Workshop Extension

LaTeX Workshop is an extension for Visual Studio Code, aiming to provide core features for LaTeX typesetting with Visual Studio Code.

- <https://github.com/James-Yu/LaTeX-Workshop>
- <https://github.com/James-Yu/LaTeX-Workshop/wiki/Compile>

Build LaTeX file by calling the command **Build LaTeX project** from the Command Palette or from the TeX badge. This command is bound to **Cmd+Ctrl+b**

You can change VS Code settings by opening Settings tab:

**Cmd+,** -> **Extensions** -> **LaTeX**

or, alternatively, by directly editing settings.json file:

`~/Library/Application\ Support/Code/User/settings.json`

Recommended settings for LaTeX Workshop:

```
{
  "latex-workshop.view.pdf.viewer": "tab",
  "latex-workshop.latex.outDir": "%DIR%/texout",
  "latex-workshop.latex.autoBuild.run": "never",
  "latex-workshop.latex.autoClean.run": "onBuilt"
}
```

### 1.3 MiKTeX

Not for Mac. Old MiKTeX installation:

`/usr/local/bin/`

`/Applications/MiKTeX\ Console.app/`

## 1.4 TinyTeX

TinyTeX - a lightweight, cross-platform, portable, and easy-to-maintain L<sup>A</sup>T<sub>E</sub>X distribution based on TeX Live.

Currently TinyTeX works best for R users. Installing and maintaining TinyTeX is easy for R users, since the R package `tinytex` has provided wrapper functions.

For other (non-R) users:

- TinyTeX docs: <https://yihui.org/tinytex/>
- In the directory  
~/Library/TinyTeX/texmf-dist/tex/latex/  
you can find all L<sup>A</sup>T<sub>E</sub>X packages installed for TinyTeX.
- If you compile a LaTeX document and run into an error message like this:  
! LaTeX Error: File 'times.sty' not found.  
It basically indicates a missing LaTeX package.  
Use the command `tlmgr search` to find the name of the missing package:  

```
$ tlmgr search --global --file "/times.sty"
psnfss: texmf-dist/tex/latex/psnfss/times.sty
```

  
In this case, the missing package is `psnfss`, and we can install a package via `tlmgr install`, e.g.,  

```
$ tlmgr install psnfss
```

  
If you still see error messages that you don't understand, you may need to update everything:  

```
$ tlmgr update --self --all
$ tlmgr path add
$ fmtutil-sys --all
```
- To uninstall TinyTeX use command line:  

```
$ tlmgr path remove
$ rm -r "~/Library/TinyTeX"
```

## 2 Epigraph

*In doing what we ought we deserve no praise, because it is our duty.*

— Saint Augustine

### 2.1 Online docs

- <https://en.wikibooks.org/wiki/LaTeX> L<sup>A</sup>T<sub>E</sub>Xwiki (very informative).
- <http://texdoc.net/> TeXdoc is a T<sub>E</sub>X and L<sup>A</sup>T<sub>E</sub>X documentation lookup system.

## 2.2 Using colors

This example shows different examples on how to use the `xcolor` package to change the color of elements in  $\text{\LaTeX}$ .

- blue
- cyan
- ForestGreen
- RubineRed

---

Change the text color to `red!`, or the background color to `BurntOrange!`.

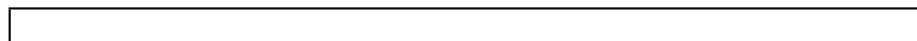
## 2.3 Units and page layout

- [https://en.wikibooks.org/wiki/LaTeX/Page\\_Layout](https://en.wikibooks.org/wiki/LaTeX/Page_Layout)

Standard  $\text{\LaTeX}$  units: mm, cm, pt, in, with  $1\text{in} = 72.27\text{pt}$  and  $1\text{pt} = 0.3515\text{mm}$  and  $1\text{mm} = 2.8445\text{pt}$ .

US Letter (letterpaper) is 8.5 x 11 in, 215.9 x 279.4 mm, 614.295 x 794.97 pt, aspect ratio 1.294.

A4 (a4paper) is 8.3 x 11.7 in, 210 x 297 mm, 597.44 x 844.95 pt, aspect ratio 1.414 ( $\approx \sqrt{2}$ ).



The current page layout picture below is generated by calling command `\layout*` from `\usepackage{layout}`.<sup>1</sup>

1 one inch + `\hoffset`  
3 `\oddsidemargin = 62pt`  
5 `\headheight = 12pt`  
7 `\textheight = 550pt`  
9 `\marginparsep = 11pt`  
11 `\footskip = 30pt`  
`\hoffset = 0pt`  
`\paperwidth = 614pt`

2 one inch + `\voffset`  
4 `\topmargin = 16pt`  
6 `\headsep = 25pt`  
8 `\textwidth = 345pt`  
10 `\marginparwidth = 65pt`  
`\marginparpush = 5pt (not shown)`  
`\voffset = 0pt`  
`\paperheight = 794pt`

<sup>1</sup>An example footnote.

Margin note  
1in=72.27pt  
1pt=0.35mm  
1mm=2.84pt

textwidth  
345pt = 4.77in  
= 121.48mm

textheight  
550pt = 7.61in  
= 193.66mm

## 3 verbatim and listings

### 3.1 verbatim

Text enclosed inside

```
\begin{verbatim} ... \end{verbatim}
```

environment is printed directly  
and all `\LaTeX{}` commands are ignored.

Text enclosed inside `\begin{verbatim*}` environment  
is printed directly  
and all `\LaTeX{}` commands are ignored,  
and white spaces are emphasized with a special symbol.

Use `\verb+<inline verbatim text>+` like this:  
The `\ldots` command produces ...

### 3.2 listings: Source code printing

- listings package documentation
- [https://www.overleaf.com/learn/latex/Code\\_listing](https://www.overleaf.com/learn/latex/Code_listing)

#### 3.2.1 minimal setup

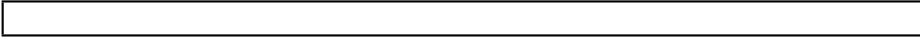
Example of using the `\begin{lstlisting}[language=Python]` environment  
from the `\usepackage{listings}` package to highlight Python code:

```
import numpy as np

def incmatrix(genl1, genl2):
    m = len(genl1)
    n = len(genl2)
    M = None #to become the incidence matrix
    VT = np.zeros((n*m, 1), int) #dummy variable

    #compute the bitwise xor matrix
    M1 = bitxormatrix(genl1)
    M2 = np.triu(bitxormatrix(genl2), 1)

    for i in range(m-1):
        for j in range(i+1, m):
            [r, c] = np.where(M2 == M1[i, j])
            for k in range(len(r)):
                VT[(i)*n + r[k]] = 1;
                VT[(i)*n + c[k]] = 1;
                VT[(j)*n + r[k]] = 1;
                VT[(j)*n + c[k]] = 1;
```



```
        if M is None:
            M = np.copy(VT)
        else:
            M = np.concatenate((M, VT), 1)

    VT = np.zeros((n*m,1), int)

    return M
```

### 3.2.2 with code styles and colours

You need `\usepackage{xcolor}` package for the code colouring.

Just like in floats (tables and figures), captions can be added to a listing for a more clear presentation. This caption can be later used in the list of Listings `\lstlistoflistings`.

```
1 import numpy as np
2
3 def incmatrix(genl1,genl2):
4     m = len(genl1)
5     n = len(genl2)
6     M = None #to become the incidence matrix
7     VT = np.zeros((n*m,1), int) #dummy variable
8
9     s = "codepurple"
10
11     #compute the bitwise xor matrix
12     M1 = bitxormatrix(genl1)
13     M2 = np.triu(bitxormatrix(genl2),1)
14
15     for i in range(m-1):
16         for j in range(i+1, m):
17             [r,c] = np.where(M2 == M1[i,j])
18             for k in range(len(r)):
19                 VT[(i)*n + r[k]] = 1;
20                 VT[(i)*n + c[k]] = 1;
21                 VT[(j)*n + r[k]] = 1;
22                 VT[(j)*n + c[k]] = 1;
23
24             if M is None:
25                 M = np.copy(VT)
26             else:
27                 M = np.concatenate((M, VT), 1)
28
29             VT = np.zeros((n*m,1), int)
30
31     return M
```

Listing 1: Python example

## 4 Inserting Images

L<sup>A</sup>T<sub>E</sub>X can not manage images by itself, so we need to use the `graphicx` package. To use it, we include the following line in the preamble:

```
\usepackage{graphicx}
```

The command `\graphicspath{ {./images/} }` tells L<sup>A</sup>T<sub>E</sub>X that the images are kept in a folder named `images` under the directory of the main document.

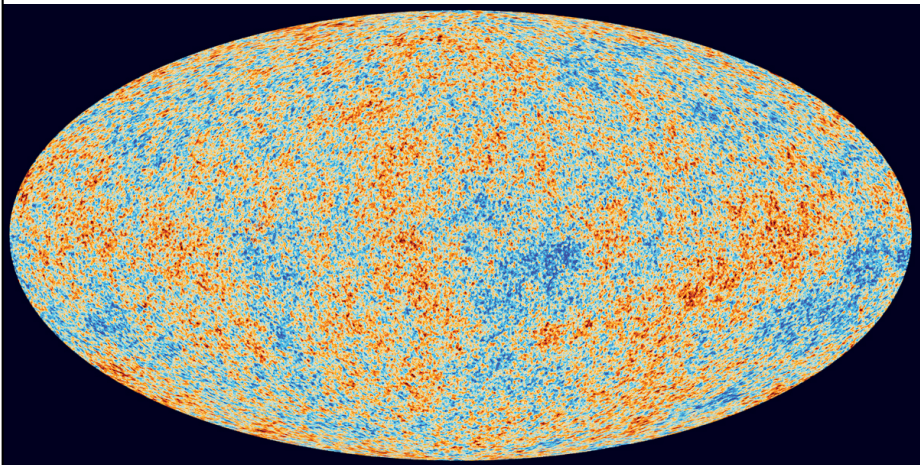


Figure 1: Cosmic Microwave Background, by Planck Space Telescope

## 5 floats

How to influence the position of float environments like `figure` and `table` in L<sup>A</sup>T<sub>E</sub>X?

## Listings

1	Python example . . . . .	6
---	--------------------------	---

## List of Figures

1	Cosmic Microwave Background, by Planck Space Telescope . . .	7
---	--	---

## 6 Tables

Col1	Col2	Col2	Col3
1	6	87837	787
2	7	78	5415
3	545	778	7507
4	545	18744	7560
5	88	788	6344

### 6.1 Tables with fixed width

cell1 dummy text dummy text dummy text	cell2	cell3
cell1 dummy text dummy text dummy text	cell5	cell6
cell7	cell8	cell9

If you don't need to control the width of each cell, but of the entire table and then distribute the space within evenly, use the package `tabularx`.

item 11	item 12	item 13
item 21	item 22	item 23

### 6.2 Positioning tables

Positioning a table is easy if they're inside a float `table` environment. Tables can be captioned, labelled and referenced by means of the `table` environment.

The table 1 is an example of referenced `LATEX` elements.



Col1	Col2	Col2	Col3
1	6	87837	787
2	7	78	5415
3	545	778	7507
4	545	18744	7560
5	88	788	6344

--

## 7 Changing the appearance of a table

1	2	3
4	5	6
7	8	9