

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

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# Chapter 1

## Code

### 1.1 verbatim

#### 1.1.1 Inline code

`\verb|<text>|` (“|” can be replaced by any character except “\*”)

```
1 \verb|Hello, world!|
```

Hello, world!

#### 1.1.2 Code block

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

```
1 \begin{verbatim}
2 def hello():
3     print("Hello, world!")
4 \end{verbatim}
```

def hello():  
 print("Hello, world!")

#### 1.1.3 Block comment

`\begin{comment} ... \end{comment}`

```
1 Text 1
2
3 \begin{comment}
4 This part will be ignored.
5 \end{comment}
6
7 Text 2
```

Text 1  
Text 2

### 1.2 listings

`\usepackage{listings}`

#### 1.2.1 Inline code

`\lstinline!<text>!` (“|” can be replaced by any character)

```
1 \lstinline|Hello, world!|
```

Hello, world!

#### 1.2.2 Code block

`\begin{lstlisting} ... \end{lstlisting}`

```

1 \begin{lstlisting}
2 def hello():
3     print("Hello, world!")
4 \end{lstlisting}

```

```

def hello():
    print("Hello , world!")

```

### 1.2.3 Input file

`\lstinputlisting{<file-path>}`

```

1 \lstinputlisting{hello.py}

```

```

def hello():
    print("Hello , world!")

```

## 1.3 minted

`\usepackage{listings}`

Minted uses Pygments for syntax highlighting.

Install Python and then Pygments.

```

1 $ pip install Pygments

```

To use Pygments on L<sup>A</sup>T<sub>E</sub>X, you need to pass `-shell-escape` flag to L<sup>A</sup>T<sub>E</sub>X.

```

1 $ lualatex -shell-escape <file>

```

If you want to compile L<sup>A</sup>T<sub>E</sub>X document containing minted with Visual Studio Code and LaTeX Workshop Plugin, add the following to `settings.json`.

```

1 {
2     "latex-workshop.latex.tools": [
3         {
4             "name": "lualatex",
5             "command": "lualatex",
6             "args": [
7                 "-shell-escape",
8                 "-synctex=1",
9                 "-interaction=nonstopmode",
10                "-file-line-error",
11                "%DOC%"
12            ],
13            "env": {}
14        },
15        {
16            "name": "bibtex",
17            "command": "bibtex",
18            "args": [
19                "%DOCFILE%"
20            ],
21            "env": {}
22        }
23    ],
24    "latex-workshop.latex.recipes": [
25        {
26            "name": "lualatex",
27            "tools": [
28                "lualatex"
29            ]
30        },
31        {

```

```

32     "name": "lualatex -> bibtex -> lualatex * 2",
33     "tools": [
34         "lualatex",
35         "bibtex",
36         "lualatex",
37         "lualatex"
38     ]
39 }
40 ]
41 }

```

### 1.3.1 Inline code

`\mintinline{<language>}{<text>}`

### 1.3.2 Code block

For single line: `\mint{<language>}{<text>}`

```

1 \mint{python}{
2 print("Hello, world!")
3 }

```

```

1 print("Hello, world!")

```

For multiple lines: `\begin{minted} ... \end{minted}`

```

1 \begin{minted}{python}
2 def hello():
3     print("Hello, world!")
4 \end{minted}

```

```

1 def hello():
2     print("Hello, world!")

```

### 1.3.3 Input file

`\inputminted{<language>}{<file-path>}`

```

1 \inputminted{python}{hello.py}

```

```

1 def hello():
2     print("Hello, world!")

```

### 1.3.4 Captions and labels

Minted provides floating listing environment to use with caption and label.

```

1 \begin{listing}[H]
2   \mint{python}|print("Hello, world!")|
3   \caption{Code example}
4   \label{lst:example}
5 \end{listing}

```

```

1 print("Hello, world!")

```

Listing 1: Code example

### 1.3.5 Options

#### Setting global minted options

inline & code blocks

```

1 \setminted{<options>}
2 \setminted[<language>]{<options>}

```

inline

```

1 \setmintedinline{<options>}
2 \setmintedinline[<language>]{<options>}

```

## Defining shortcuts

minted environment

```
1 \newminted{<language>}{<options>} % default environment-name: <language>code
2 \newminted[<environment-name>]{<language>}{<options>}
3
4 \begin{<environment-name>}
5 \end{<environment-name>}
```

mint command

```
1 \newmint{<language>}{<options>} % default macro-name: <language>
2 \newmint[<macro-name>]{<language>}{<options>}
3
4 <macro-name>/<text>/ % ``/' can be replaces by any character
```

mintinline command

```
1 \newmintinline{<language>}{<options>} % default macro-name: <language>inline
2 \newmintinline[<macro-name>]{<language>}{<options>}
3
4 <macro-name>/<text>/ % ``/' can be replaces by any character
```

inputminted command

```
1 \newmintedfile{<language>}{<options>} % default macro-name: <language>file
2 \newmintedfile[<macro-name>]{<language>}{<options>}
3
4 <macro-name>{<file-path>}
```

## Available options

- autogobble (boolean): Remove gobble (leading whitespace)
- breaklines (boolean): Automatically break long lines
- frame (none | leftline | topline | bottomline | lines | single): Put lines around the code
- linenos (boolean): Linen numbers
- numbersep (dimension): Gap between numbers and start of line

```
1 \setminted{
2   autogobble,
3   breakanywhere,
4   breaklines,
5   frame=single,
6   linenos,
7   numbersep=2mm,
8 }
```

# Chapter 2

## Split files

### 2.1 input

Includes contents of the file.

```
1 \input{<subfile-path>}
```

Listing 2: main file

```
1 <file-content>
```

Listing 3: sub file

### 2.2 include

Includes contents of the file and automatically starts a new page. Doesn't allow nesting.

```
1 \include{<subfile-path>}
```

Listing 4: main file

```
1 <file-content>
```

Listing 5: sub file

### 2.3 standalone

```
1 \usepackage{standalone}  
2  
3 \input{<subfile-path>}
```

Listing 6: main file

```
1 \documentclass[preview]{standalone}
```

Listing 7: sub file

### 2.4 subfiles

```
1 \usepackage{subfiles}  
2  
3 \subfile{<subfile-path>}
```

Listing 8: main file

```
1 \documentclass[<mainfile-path>]{subfiles}
```

Listing 9: sub file



# Chapter 3

## Math

### 3.1 Text over and under symbols

#### 3.1.1 Place text using overset & underset

```
1 \usepackage{amsmath} % align
2
3 \begin{align}
4   a \overset{why?}{=} b \\
5   a \underset{why?}{=} b
6 \end{align}
```

$$a \overset{why?}{=} b \quad (3.1)$$

$$a \underset{why?}{=} b \quad (3.2)$$

#### 3.1.2 Remove extra spaces with mathclap

```
1 \usepackage{amsmath} % align
2 \usepackage{mathtools} % mathclap
3
4 \begin{align}
5   a \overset{
6     \mathclap{why?}
7   }{=} b \\
8   a \underset{
9     \mathclap{why?}
10  }{=} b
11 \end{align}
```

$$a \overset{why?}{=} b \quad (3.3)$$

$$a \underset{why?}{=} b \quad (3.4)$$

#### 3.1.3 Multiple lines with substack

```
1 \usepackage{amsmath} % align, substack
2 \usepackage{mathtools} % mathclap
3
4 \begin{align}
5   a \overset{
```

```

6      \mathclap{
7      \substack{
8      why?    \\
9      how?
10     }
11   }
12 }{=} b \\
13 a \underset{
14   \mathclap{
15   \substack{
16   why?    \\
17   how?
18   }
19   }
20 }{=} b
21 \end{align}

```

$$\begin{array}{c} \text{why?} \\ \text{how?} \\ a \equiv b \end{array} \quad (3.5)$$

$$\begin{array}{c} a = b \\ \text{why?} \\ \text{how?} \end{array} \quad (3.6)$$

### 3.1.4 Place arrows

```

1 \usepackage{amsmath} % align, substack
2 \usepackage{mathtools} % mathclap
3
4 \begin{align}
5   a \overset{
6     \mathclap{
7       \substack{
8       why?    \\
9       how?    \\
10      \downarrow
11      }
12    }
13 }{=} b \\
14 a \underset{
15   \mathclap{
16   \substack{
17   \uparrow \\
18   why?    \\
19   how?
20   }
21   }
22 }{=} b
23 \end{align}

```

$$\begin{array}{c} \text{why?} \\ \text{how?} \\ a \downarrow \equiv b \end{array} \quad (3.7)$$

$$\begin{array}{c} a = b \\ \uparrow \\ \text{why?} \\ \text{how?} \end{array} \quad (3.8)$$

### 3.1.5 Use long arrows with \big

```

1 \usepackage{amsmath} % align, substack
2 \usepackage{mathtools} % mathclap

```

```

3
4 \begin{align}
5   a \overset{
6     \mathclap{
7       \substack{
8         why?    \\
9         how?    \\
10        \big \downarrow
11      }
12    }
13 }{=} b \quad \! \!
14 a \underset{
15   \mathclap{
16     \substack{
17       \big \uparrow \! \!
18       why?    \\
19       how?
20     }
21   }
22 }{=} b
23 \end{align}

```

$$\begin{array}{c} \textit{why?} \\ \textit{how?} \\ \downarrow \\ a \overset{=}{=} b \end{array} \quad (3.9)$$

$$\begin{array}{c} a = b \\ \uparrow \\ \textit{why?} \\ \textit{how?} \end{array} \quad (3.10)$$

## 3.2 Curly braces over and under equations

```

1 \begin{align}
2   x
3   = \overbrace{a \cdot b \cdot c}^{\textit{explanation}}
4   + \underbrace{d \cdot e \cdot f}_{\textit{explanation}}
5 \end{align}

```

$$x = \overbrace{a \cdot b \cdot c}^{\textit{explanation}} + \underbrace{d \cdot e \cdot f}_{\textit{explanation}} \quad (3.11)$$

### 3.2.1 Inside square root or \left & \right parentheses etc.

```

1 \begin{align}
2   x
3   &= \sqrt{
4     \underbrace{a \cdot b \cdot c}_{\textit{explanation}}
5   } \quad \! \!
6   y &= \left[
7     \underbrace{d \cdot e \cdot f}_{\textit{explanation}}
8     \right]
9 \end{align}

```

$$x = \sqrt{\underbrace{a \cdot b \cdot c}_{\textit{explanation}}} \quad (3.12)$$

$$y = \left[ \underbrace{d \cdot e \cdot f}_{\text{explanation}} \right] \quad (3.13)$$

### 3.2.2 Use smash to write explanation outside

```

1 \begin{align}
2   x
3   &= \sqrt{\smash[b]{\underbrace{a \cdot b \cdot c}_{\text{explanation}}}}
4   \\
5   y &= \left[ \smash[b]{\underbrace{d \cdot e \cdot f}_{\text{explanation}}} \right]
6   \\
7 \end{align}

```

$$x = \sqrt{\underbrace{a \cdot b \cdot c}_{\text{explanation}}} \quad (3.14)$$

$$y = \left[ \underbrace{d \cdot e \cdot f}_{\text{explanation}} \right] \quad (3.15)$$

### 3.2.3 Add vertical space

```

1 \begin{align}
2   x
3   &= \sqrt{\smash[b]{\underbrace{a \cdot b \cdot c}_{\text{explanation}}}}
4   \\
5   &\\[\baselineskip]
6   y &= \left[ \smash[b]{\underbrace{d \cdot e \cdot f}_{\text{explanation}}} \right]
7   \\
8 \end{align}

```

$$x = \sqrt{\underbrace{a \cdot b \cdot c}_{\text{explanation}}} \quad (3.16)$$

$$y = \left[ \underbrace{d \cdot e \cdot f}_{\text{explanation}} \right] \quad (3.17)$$

## 3.3 Vector notations

- arrow:  $\vec{x}$
- bold:  $\mathbf{x}$
- bm package:  $\boldsymbol{x}$

## 3.4 Derivative notations

```
\usepackage{derivative}
```

### 3.4.1 Ordinary derivative

```

1 \begin{align}
2   & \frac{df}{dx} \\
3   & \text{\texttt{\textbackslash odv}\{f\}\{x\}} \\
4   & \text{\texttt{\textbackslash odv*}\{f\}\{x\}} \\
5 \end{align}

```

$$\frac{df}{dx} \quad (3.18)$$

$$\frac{df}{dx} \quad (3.19)$$

$$\frac{d}{dx}f \quad (3.20)$$

### 3.4.2 Partial derivative

```

1 \begin{align}
2   & \frac{\partial f}{\partial x} \\
3   & \text{\texttt{\textbackslash pdv}\{f\}\{x\}} \\
4   & \text{\texttt{\textbackslash pdv*}\{f\}\{x\}} \\
5   & \text{\texttt{\textbackslash pdv}\{f\}\{x\}} \\
6   & \text{\texttt{\textbackslash pdv}\{f\}\{x,y\}} \\
7   & \text{\texttt{\textbackslash pdv}\[order={2,3}]\{f\}\{x,y,z\}} \\
8 \end{align}

```

$$\frac{\partial f}{\partial x} \quad (3.21)$$

$$\frac{\partial f}{\partial x} \quad (3.22)$$

$$\frac{\partial}{\partial x}f \quad (3.23)$$

$$\partial_x f \quad (3.24)$$

$$\frac{\partial^2 f}{\partial x \partial y} \quad (3.25)$$

$$\frac{\partial^6 f}{\partial x^2 \partial y^3 \partial z} \quad (3.26)$$

### 3.4.3 Material derivative

```

1 \begin{align}
2   & \frac{Df}{Dx} \\
3   & \text{\texttt{\textbackslash mdv}\{f\}\{x\}} \\
4   & \text{\texttt{\textbackslash mdv*}\{f\}\{x\}} \\
5 \end{align}

```

$$\frac{Df}{Dx} \quad (3.27)$$

$$\frac{Df}{Dx} \quad (3.28)$$

$$\frac{D}{Dx}f \quad (3.29)$$

### 3.4.4 Functional derivative

```

1 \begin{align}
2   & \frac{\delta f}{\delta x} \\
3   & \text{\texttt{\textbackslash fdv}\{f\}\{x\}} \\
4   & \text{\texttt{\textbackslash fdv*}\{f\}\{x\}} \\
5 \end{align}

```

$$\frac{\delta f}{\delta x} \quad (3.30)$$

$$\frac{\delta f}{\delta x} \quad (3.31)$$

$$\frac{\delta}{\delta x}f \quad (3.32)$$

### 3.4.5 Average rate of change

```

1 \begin{align}
2   & \frac{\Delta f}{\Delta x} \\
3   & \text{\texttt{\textbackslash adv}\{f\}\{x\}} \\
4 \end{align}

```

$$\frac{\Delta f}{\Delta x} \quad (3.33)$$

$$\frac{\Delta f}{\Delta x} \quad (3.34)$$

### 3.4.6 Jacobian

```

1 \begin{align}
2   & \frac{\partial}{\partial} \\
3   & \text{\texttt{\textbackslash partial}\{f, g, h\}} \\
4   & \text{\texttt{\textbackslash partial}\{x, y, z\}} \\
5   & \text{\texttt{\textbackslash partial}\{x, y, z\}} \\
6   & \text{\texttt{\textbackslash partial}\{x, y, z\}} \\
7   & \text{\texttt{\textbackslash jdv}\{f, g, h\}\{x, y, z\}} \\
8 \end{align}

```

$$\frac{\partial(f, g, h)}{\partial(x, y, z)} \quad (3.35)$$

$$\frac{\partial(f, g, h)}{\partial(x, y, z)} \quad (3.36)$$

## 3.5 Cancel

```
\usepackage{cancel}
```

```
1 \begin{align}
2   a
3   = \cancel{b}
4   + \bcancel{c}
5   + \xcancel{d}
6   + \cancelto{x}{e}
7 \end{align}
```

$$a = \cancel{b} + \cancel{c} + \cancel{d} + \cancel{e}^x \quad (3.37)$$

## 3.6 Multiline equations

```
\usepackage{amsmath}
```

```
1 \multirow{<nrows>}{<text>}
```

```
1 \begin{align}
2   \begin{split}
3     x
4     &= a \cdot b \cdot c \\
5     &+ d \cdot e \cdot f
6   \end{split}
7 \end{align}
```

$$x = a \cdot b \cdot c + d \cdot e \cdot f \quad (3.38)$$

# Chapter 4

## Layout

### 4.1 geometry

```
\usepackage{geometry}
```

```
1 \usepackage[<options>]{geometry}
```

or

```
1 \usepackage{geometry}
2
3 \geometry{<options>}
```

#### 4.1.1 Paper size

```
1 \geometry{
2   paper=<paper-name>, % paper size
3   screen=<(W,H)>, % paper size in width & height
4   paperwidth=<length>,
5   paperheight=<length>,
6   papersize={<width>,<height>},
7   landscape,
8   portrait,
9 }
```

#### 4.1.2 Margin size

```
1 \geometry{
2   left=<length>,
3   inner=<length>,
4   right=<length>,
5   outer=<length>,
6   top=<length>,
7   bottom=<length>,
8   hmargin=<length>, % left & right
9   vmargin=<length>, % top & bottom
10  margin=<length>, % hmargin & vmargin
11 }
```

#### 4.1.3 Example

```
1 \geometry{
2   paper=a4paper,
```

```
3   margin=15mm,  
4 }
```



# Chapter 5

## Path

### 5.1 currfile

```
\usepackage{currfile}
```

Currfile provides path information for the current file.

```
1 \currfiledir % directory with slash
2 \currfilebase % name without extension
3 \currfileext % extension without dot
4 \currfilename % base + "." + extension
5 \currfilepath % directory + name
```