

L^AT_EX

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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}`

<pre> 1 Text 1 2 3 \begin{comment} 4 This part will be ignored. 5 \end{comment} 6 7 Text 2 </pre>	<pre> Text 1 Text 2 </pre>
---	----------------------------

1.2 listings

`\usepackage{listings}`

1.2.1 Inline code

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

<pre> 1 \lstinline Hello, world! </pre>	<pre> Hello, world! </pre>
--	----------------------------

1.2.2 Code block

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

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

1.2.3 Input file

`\lstinputlisting{<file-path>}`

<pre> 1 \lstinputlisting{hello.py} </pre>	<pre> def hello(): print("Hello , world!") </pre>
---	---

1.3 minted

`\usepackage{listings}`

Minted uses Pygments for syntax highlighting.

Install Python and then Pygments.

<pre> 1 \$ pip install Pygments </pre>
--

To use Pygments on L^AT_EX, you need to pass `-shell-escape` flag to L^AT_EX.

```
1 $ lualatex -shell-escape <file>
```

If you want to compile L^AT_EX 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 }
```

```

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}
   ↪ y}

```

```

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]{stan  
↪ dalone}
```

Listing 7: sub file

2.4 subfiles

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

Listing 8: main file

```
1 \documentclass[<mainfile-pat
   ↳ h>]{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}
```

$$a \overset{why?}{=} b \tag{3.1}$$

$$a \underset{why?}{=} b \tag{3.2}$$

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}

```

$$a \overset{why?}{\underset{how?}{=}} b \quad (3.5)$$

$$a = \underset{why?}{\overset{how?}{b}} \quad (3.6)$$

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}

```

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

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

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    \\

```

```

14 a \underset{
15   \mathclap{
16     \substack{
17       \big \uparrow \\
18       why?    \\
19         how?
20     }
21   }
22 }{=} b
23 \end{align}

```

$$\begin{array}{c}
 \textit{why?} \\
 \textit{how?} \\
 \downarrow \\
 a \equiv b
 \end{array}
 \tag{3.9}$$

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

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}

```

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

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   }
6   y &= \left[
7     \underbrace{d \cdot e \cdot f}_{\textit{explanation}}

```

```

8 \right]
9 \end{align}

```

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

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

3.2.2 Use smash to write explanation outside

```

1 \begin{align}
2   x
3   &= \sqrt{
4     \smash[b]{
5       \underbrace{a \cdot b \cdot c}_{\text{explanation}}
6     }
7   } \\
8   y &= \left[
9     \smash[b]{
10      \underbrace{d \cdot e \cdot f}_{\text{explanation}}
11    }
12   \right]
13 \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{
4     \smash[b]{
5       \underbrace{a \cdot b \cdot c}_{\text{explanation}}
6     }
7   } \\
8   y &= \left[
9     \smash[b]{

```



```

10 \underbrace{d \cdot e \cdot f}_{\text{explanation}}
11 }
12 \right]
13 \end{align}

```

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

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

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 & \quad \& \frac{df}{dx} \quad \backslash
3 & \quad \& \text{odv}\{f\}\{x\} \quad \backslash
4 & \quad \& \text{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}{\partial x} f \\
3   & \& \frac{\partial}{\partial x} f \\
4   & \& \frac{\partial}{\partial x} f \\
5   & \& \frac{\partial}{\partial x} f \\
6   & \& \frac{\partial}{\partial x} f \\
7   & \& \frac{\partial}{\partial x} f \\
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   & \& \frac{Df}{Dx} \\
4   & \& \frac{Df}{Dx} \\
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   & \& \frac{\delta f}{\delta x} \\
4   & \& \frac{\delta f}{\delta 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   & \& \frac{\Delta f}{\Delta 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 (f, g, h)} \\
3   & \{ \\
4   & \frac{\partial}{\partial (x, y, z)} \\
5   & \} \\
6   & \backslash \\
7   & \frac{\partial (f, g, h)}{\partial (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}
```

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

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}
```

$$\begin{aligned} x &= a \cdot b \cdot c \\ &+ d \cdot e \cdot f \end{aligned} \quad (3.38)$$