LaTeX

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Contents

Chapter 1

Code

1.1 verbatim

1.1.1 Inline code

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

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

Hello, world!

1.1.2 Code block

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

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

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

1.1.3 Block comment

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

```
Text 1

\begin{comment}
This part will be ignored.
\end{comment}

Text 2
```

Text 1
Text 2

1.2 listings

`\usepackage{listings}`

1.2.1 Inline code

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

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

Hello, world!

1.2.2 Code block

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

```
\begin{lstlisting}
def hello():
    print("Hello, world!")
\end{lstlisting}
```

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

1.2.3 Input file

`\lstinputlisting{<file-path>}`

```
\lstinputlisting{hello.py}
```

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

1.3 minted

`\usepackage{listings}`

Minted uses Pygments for syntax highlighting.

Install Python and then Pygments.

```
$ pip install Pygments
```

To use Pygments on LaTeX, you need to pass `-shell-escape` flag to LaTeX.

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

If you want to compile LaTeXdocument containing minted with Visual Studio Code and LaTeX Workshop Plugin, add the following to `settings.json`.

```
{
  "latex-workshop.latex.tools": [
    {
      "name": "lualatex",
      "command": "lualatex",
      "args": [
        "-shell-escape",
        "-synctex=1",
        "-interaction=nonstopmode",
        "-file-line-error",
        "%DOC%"
      ],
      "env": {}
    },
    {
      "name": "bibtex",
      "command": "bibtex",
      "args": [
        "%DOCFILE%"
      ],
      "env": {}
    }
  ],
  "latex-workshop.latex.recipes": [
    {
      "name": "lualatex",
      "tools": [
        "lualatex"
      ]
    },
    {
```

```
      "name": "lualatex -> bibtex -> lualatex * 2",
      "tools": [
        "lualatex",
        "bibtex",
        "lualatex",
        "lualatex"
      ]
    }
  ]
}
```

1.3.1 Inline code

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

1.3.2 Code block

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

```
\mint{python}{
print("Hello, world!")
}
```

```
print("Hello, world!")
```

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

```
\begin{minted}{python}
def hello():
    print("Hello, world!")
\end{minted}
```

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

1.3.3 Input file

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

```
\inputminted{python}{hello.py}
```

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

1.3.4 Captions and labels

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

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

```
print("Hello, world!")
```

Listing 1: Code example

1.3.5 Options

Setting global minted options

inline & code blocks

```
\setminted{<options>}
\setminted[<language>]{<options>}
```

inline

```
\setmintedinline{<options>}
\setmintedinline[<language]{<options>}
```

Defining shortcuts

minted environment

```
\newminted{<language>}{<options>} % default environment-name: <language>code
\newminted[<environment-name>]{<language>}{<options>}

\begin{<environment-name>}
\end{<environment-name>}
```

mint command

```
\newmint{<language>}{<options>} % default macro-name: <language>
\newmint[<macro-name>]{<language>}{<options>}

\<macro-name>/<text>/ % ``/'' can be replaces by any character
```

mintinline command

```
\newmintinline{<language>}{<options>} % default macro-name: <language>inline
\newmintinline[<macro-name>]{<language>}{<options>}

\<macro-name>/<text>/ % ``/'' can be replaces by any character
```

inputminted command

```
\newmintedfile{<language>}{<options>} % default macro-name: <language>file
\newmintedfile[<macro-name>]{<language>}{<options>}

\<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

```
\setminted{
  autogobble,
  breakanywhere,
  breaklines,
  frame=single,
  linenos,
  numbersep=2mm,
}
```

Chapter 2

Split files

2.1 input

Includes contents of the file.

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

Listing 2: main file

```
<file-content>
```

Listing 3: sub file

2.2 include

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

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

Listing 4: main file

```
<file-content>
```

Listing 5: sub file

2.3 standalone

```
\usepackage{standalone}

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

Listing 6: main file

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

Listing 7: sub file

2.4 subfiles

```
\usepackage{subfiles}

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

Listing 8: main file

```
\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

```
\usepackage{amsmath} % align

\begin{align}
  a \overset{why?}{=} b \\
  a \underset{why?}{=} b
\end{align}
```

$$a \overset{why?}{=} b \tag{3.1}$$
$$a \underset{why?}{=} b \tag{3.2}$$

3.1.2 Remove extra spaces with mathclap

```
\usepackage{amsmath} % align
\usepackage{mathtools} % mathclap

\begin{align}
  a \overset{
    \mathclap{why?}
  }{=} b \\
  a \underset{
    \mathclap{why?}
  }{=} b
\end{align}
```

$$a \overset{why?}{=} b \tag{3.3}$$
$$a \underset{why?}{=} b \tag{3.4}$$

3.1.3 Multiple lines with substack

```
\usepackage{amsmath} % align, substack
\usepackage{mathtools} % mathclap

\begin{align}
  a \overset{
```

```
    \mathclap{
      \substack{
  why?   \\
         how?
       }
    }
  }{=} b \\
  a \underset{
    \mathclap{
      \substack{
  why?   \\
         how?
       }
    }
  }{=} b
\end{align}
```

$$\overset{\substack{why?\\how?}}{a = b} \tag{3.5}$$

$$a \underset{\substack{why?\\how?}}{=} b \tag{3.6}$$

3.1.4 Place arrows

```
\usepackage{amsmath} % align, substack
\usepackage{mathtools} % mathclap

\begin{align}
  a \overset{
    \mathclap{
      \substack{
  why?     \\
  how?     \\
        \downarrow
       }
    }
  }{=} b   \\
  a \underset{
    \mathclap{
      \substack{
  \uparrow \\
  why?     \\
         how?
       }
    }
  }{=} b
\end{align}
```

$$\overset{\substack{why?\\how?}}{\underset{\downarrow}{a = b}} \tag{3.7}$$

$$\underset{\substack{\uparrow\\why?\\how?}}{a = b} \tag{3.8}$$

3.1.5 Use long arrows with \big

```
\usepackage{amsmath} % align, substack
\usepackage{mathtools} % mathclap
```

```
\begin{align}
  a \overset{
    \mathclap{
      \substack{
  why?      \\
  how?      \\
        \big \downarrow
      }
    }
  }{=} b    \\
  a \underset{
    \mathclap{
      \substack{
  \big \uparrow \\
  why?      \\
        how?
      }
    }
  }{=} b
\end{align}
```

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

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

3.2 Curly braces over and under equations

```
\begin{align}
  x
  = \overbrace{a \cdot b \cdot c}^{explanation}
  + \underbrace{d \cdot e \cdot f}_{explanation}
\end{align}
```

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

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

```
\begin{align}
  x
    & = \sqrt{
    \underbrace{a \cdot b \cdot c}_{explanation}
  }             \\
  y & = \left[
    \underbrace{d \cdot e \cdot f}_{explanation}
    \right]
\end{align}
```

$$x = \sqrt{\underbrace{a \cdot b \cdot c}_{explanation}} \tag{3.12}$$

$$y = \left[\underbrace{d \cdot e \cdot f}_{explanation} \right] \tag{3.13}$$

3.2.2 Use smash to write explanation outside

```
\begin{align}
  x
    & = \sqrt{
    \smash[b]{
      \underbrace{a \cdot b \cdot c}_{explanation}
    }
  }             \\
  y & = \left[
    \smash[b]{
      \underbrace{d \cdot e \cdot f}_{explanation}
    }
    \right]
\end{align}
```

$$x = \sqrt{\underbrace{a \cdot b \cdot c}_{explanation}} \tag{3.14}$$

$$y = [\underbrace{d \cdot e \cdot f}_{explanation}] \tag{3.15}$$

3.2.3 Add vertical space

```
\begin{align}
  x
    & = \sqrt{
    \smash[b]{
      \underbrace{a \cdot b \cdot c}_{explanation}
    }
  }             \\[\baselineskip]
  y & = \left[
    \smash[b]{
      \underbrace{d \cdot e \cdot f}_{explanation}
    }
    \right]
\end{align}
```

$$x = \sqrt{\underbrace{a \cdot b \cdot c}_{explanation}} \tag{3.16}$$

$$y = [\underbrace{d \cdot e \cdot f}_{explanation}] \tag{3.17}$$

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

```
\begin{align}
  & \frac{df}{dx} \\
  & \odv{f}{x} \\
  & \odv*{f}{x}
\end{align}
```

$$\frac{df}{dx} \tag{3.18}$$
$$\frac{\mathrm{d}f}{\mathrm{d}x} \tag{3.19}$$
$$\frac{\mathrm{d}}{\mathrm{d}x}f \tag{3.20}$$

3.4.2 Partial derivative

```
\begin{align}
  & \frac{\partial f}{\partial x} \\
  & \pdv{f}{x} \\
  & \pdv*{f}{x} \\
  & \pdv{f}!{x} \\
  & \pdv{f}{x,y}
  & \pdv[order={2,3}]{f}{x,y,z} \\
\end{align}
```

$$\frac{\partial f}{\partial x} \tag{3.21}$$
$$\frac{\partial f}{\partial x} \tag{3.22}$$
$$\frac{\partial}{\partial x}f \tag{3.23}$$
$$\partial_x f \tag{3.24}$$
$$\frac{\partial^2 f}{\partial x\,\partial y} \tag{3.25}$$
$$\frac{\partial^6 f}{\partial x^2\,\partial y^3\,\partial z} \tag{3.26}$$

3.4.3 Material derivative

```
\begin{align}
  & \frac{Df}{Dx} \\
  & \mdv{f}{x} \\
  & \mdv*{f}{x}
\end{align}
```

$$\frac{Df}{Dx} \tag{3.27}$$
$$\frac{\mathrm{D}f}{\mathrm{D}x} \tag{3.28}$$
$$\frac{\mathrm{D}}{\mathrm{D}x}f \tag{3.29}$$

3.4.4 Functional derivative

```
\begin{align}
  & \frac{\delta f}{\delta x} \\
  & \fdv{f}{x} \\
  & \fdv*{f}{x}
\end{align}
```

$$\frac{\delta f}{\delta x} \tag{3.30}$$
$$\frac{\delta f}{\delta x} \tag{3.31}$$
$$\frac{\delta}{\delta x}f \tag{3.32}$$

3.4.5 Average rate of change

```
\begin{align}
  & \frac{\Delta f}{\Delta x} \\
  & \adv{f}{x}
\end{align}
```

$$\frac{\Delta f}{\Delta x} \tag{3.33}$$
$$\frac{\Delta f}{\Delta x} \tag{3.34}$$

3.4.6 Jacobian

```
\begin{align}
  & \frac{
    \partial (f, g, h)
  }{
    \partial (x, y, z)
  } \\
  & \jdv{f, g, h}{x, y, z}
\end{align}
```

$$\frac{\partial(f, g, h)}{\partial(x, y, z)} \tag{3.35}$$
$$\frac{\partial\,(f, g, h)}{\partial\,(x, y, z)} \tag{3.36}$$

3.5 Cancel

```
\usepackage{cancel}
```

```
\begin{align}
  a
  = \cancel{b}
  + \bcancel{c}
  + \xcancel{d}
  + \cancelto{x}{e}
\end{align}
```

$$a = \cancel{b} + \bcancel{c} + \xcancel{d} + \cancelto{x}{e} \tag{3.37}$$

3.6 Multiline equations

```
\usepackage{amsmath}
```

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

```
\begin{align}
  \begin{split}
    x
    & = a \cdot b \cdot c \\
    & + d \cdot e \cdot f
  \end{split}
\end{align}
```

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

Chapter 4

Layout

4.1 geometry

```
\usepackage{geometry}
```

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

or

```
\usepackage{geometry}

\geometry{<options>}
```

4.1.1 Paper size

```
\geometry{
  paper=<paper-name>, % paper size
  screen=<(W,H)>, % paper size in width & height
  paperwidth=<length>,
  paperheight=<length>,
  papersize={<width>,<height>},
  landscape,
  portrait,
}
```

4.1.2 Margin size

```
\geometry{
  left=<length>,
  inner=<length>,
  right=<length>,
  outer=<length>,
  top=<length>,
  bottom=<length>,
  hmargin=<length>, % left & right
  vmargin=<length>, % top & bottom
  margin=<length>, % hmargin & vmargin
}
```

4.1.3 Example

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

```
  margin=15mm,
}
```