LaTeX:
from dummy to TeXnician
Document creation

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lesson 2

What we will know?

Technical agreements

Document Creation

Presentation Creation

What we will know?

Technical agreements

Document Creation

Presentation Creation

Agreements

inclass/outclass versions

- two slightly different versions for class and home
- class version is more interactive and contains less information
- ⟷ this line will be shown only at home version

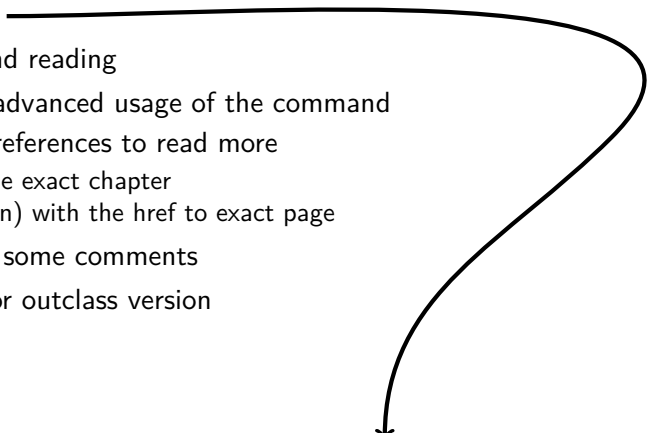
Frame for home

Agreements

II

Footnotes

- For second reading
- Contain advanced usage of the command
- Contain references to read more
  - to the exact chapter
  - (often) with the href to exact page
- Contains some comments
- Mostly for outclass version

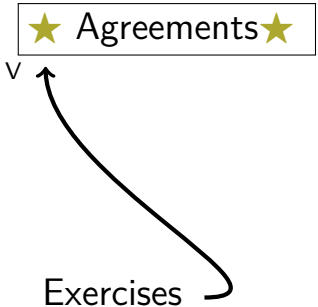


Like this

Agreements
III

Additional information – “magic”

- To have the full picture
- Not to analyze or to puzzle out in class



- To work in class

Special thanks to

- David Saykin for creating the presentation part about beamer in 2019

Our TAs:

- Peter Borisovets
- Pavel Kuzmin
- Anna Litvin

What we will know?

Technical agreements

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38 Nice section

$$y = \frac{x+1}{b} \tag{3}$$

We have a nice equation (3) on page 7 inside the section 38.

7

How to structure & refer the document

1. add structure element. TEX will automatically calculate it's serial number incrementing the previous one.
2. refer to the element added before or after label. Refer to specific page, to specific equation, to specific biblio record or item

} TEX use "counters" implicitly

how all this works

1. TEX has a counter for... lots of stuff
2. When you add an element (section, equation, etc), the command updates its counter and prints it near the element
3. To reference an element, you need to explicitly tell TEX about it.
4. When TEX "sees" this guideline, it saves the related counter to external file
5. When TEX runs second time and finds the place where you need to insert the reference, it looks at the file and gets counter value from the file
6. Sometimes (e.g.: bibliography) you run external command (e.g.: bibtex) to create the mentioned file
7. By the way: TEX always "reads" document from top to bottom. The only way some command to affect anything *before* the command appears is throw external file. The set of commands that do this is quite small

→ ←

(We will look more precisely at the last lecture.)

What we will know?

What document consists of?

- Title
- Authors
- Table of contents
- Table of figures
- Table of tables
- Sections, subsections,..

Title

title

```
\title{My beautiful title}
\begin{document}
\maketitle{}
\end{document}
```

- `\title` before begin of the document
- `\maketitle` after begin of the document

My beautiful title

November 28, 2018

Title

date

```
\title{My beautiful title}
\date{This text supposed to be a date...\\
↪  \the\year -\the\month -\the\day. In
↪  other words, \today}
\begin{document}
\maketitle{}
\end{document}
```

My beautiful title

This text supposed to be a date...
2024-12-24. In other words, December 24, 2024

- by defaut LaTeX think you use `\date{\today}`
  - `\today` is the date of last document compilation
- you can put anything inside `\date{}` command
- use `\date{}` without arguments to remove the string

Title

authors

```
\title{My beautiful title}
\date{This text supposed to be a date...\\
↪  \today}
\author{Vasia\thanks{Skoltech} \and
↪  Mandrid\thanks{we acknowledge the
↪  cats, our lords!}}
\begin{document}
\maketitle{}
\end{document}
```

My beautiful title

Vasia* Mandrid†

This text supposed to be a date...
November 28, 2018

*Skoltech
†we acknowledge the cats, our lords!

- \author for put the author
- \and (can be) used to concatinate several authors
  - You always can use just plain text
- \thanks for a footnote

Abstract

```
\begin{abstract}
    Hello
\end{abstract}
```

Abstract

Hello

Structure

```
\begin{document}
\part{''part''} text \par
% \chapter{''chapter''} text \par
\section{''section''} text \par
\subsection{''subsection''} text \par
\subsubsection{''subsubsection''} text
↪           \par
\paragraph{''paragraph''} text \par
\subparagraph{''subparagraph''} text\par
\end{document}
```

Part I

”part”

text

1 ”section”

text

1.1 ”subsection”

text

1.1.1 ”subsubsection”

text

”paragraph” text

”subparagraph” text

Document_Structure#Section_numbering, Sections_and_chapters, man: 6, lv: IV.5

You can use `\section[short name]{long name}` to put short name to table of contents and `\renewcommand{\chaptername}{new name}` (lv: IV.5.3) to change the standard name

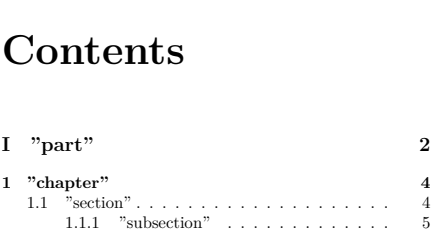
Structure

Tips

- Use \<command>* (with *) to ommit the numbering
- The structure (and titles) is not pre-build into LaTeX: they are defined inside class files ⇒ not all classes contain all commands

Table of content

```
\tableofcontents
\newpage % for new page
\part{''part''} text \par
\chapter{''chapter''} text \par
\section{''section''} text \par
\subsection{''subsection''} text \par
\subsubsection{''subsubsection''} text
↪           \par
\paragraph{''paragraph''} text \par
\subparagraph{''subparagraph''} text\par
```



`\tableofcontents` for create it, `\newpage` for new page.

Notice that not all structure elements are mentioned it ToC!

man: 25.1

`\contentsname` — the name of the ToC; `secnumdepth` counter (lv: IX.3.1, man: 6) to change what will be included in ToC

Table of...

- `\listoffigures` for figures
- `\listoftables` for tables

lv: IV.8.1, man: 25.1

You can use `\caption[short name]{long name}` to put `short name` to the lists, `\listfigurename` and `\listtablename` — the names of the Lists.

What we will know?

How good it will be if...

38 Nice section

$$y = \frac{x+1}{b} \tag{3}$$

7

I use `\only<2>{text}` for such effect. Also `\setcounter` was used in source.

How good it will be if...we could write like this

38 Nice section

$$y = \frac{x+1}{b} \tag{3}$$

We have a nice equation (3) on page 7 inside the section 38.

7

I use `\only<2>{text}` for such effect. Also `\setcounter` was used in source.

How good it will be if...we could write like this

We can!

I use `\only<2>{text}` for such effect. Also `\setcounter` was used in source.

Step 1: \label

```
\section{Nice section \label{sec:nice}}
\begin{equation}
     y=\frac{x+1}{b} \label{niceeq}
\end{equation}
```

for whole reference mechanism: man: 7 lv: I.2.11 /Cross_referencing_sections_and_equations, /Labels_and_Cross-referencing

Step 2: \ref and \pageref

```
We have a nice equation (\ref{niceeq}) on page \pageref{niceeq}
↪  inside the section \ref{sec:nice}.
```

Combined

```
\section{Nice section \label{sec:nice}}
\begin{equation}
     y=\frac{x+1}{b} \label{niceeq}
\end{equation}

We have a nice equation (\ref{niceeq}) on page \pageref{niceeq}
↪  inside the section \ref{sec:nice}.
```

Notice `prefix:id` notation (`sec:nice`). It is rather common

Problem 1: lots of labels!

What if you have too many marks throughout the document?

Use package showlabels

```
\usepackage{showlabels}
\section{Nice section \label{sec:nice}}
\begin{equation}
     y=\frac{x+1}{b} \label{niceeq}
\end{equation}
```

38 Nice section {sec:nice}

$$y = \frac{x+1}{b} \qquad (3) \quad \{\text{niceeq}\}$$

We have a nice equation (3) on page 7 inside the section 38.

7

http://ctan.altspu.ru/macros/latex/contrib/showlabels/showlabels.pdf

Problem 2: Typos

```
\section{Nice section \label{sec:nice}}
\begin{equation}
     y=\frac{x+1}{b} \label{niceEeq}
\end{equation}

We have a nice equation (\ref{niceeq}) on
↪  page \pageref{niceeq} inside the
↪  section \ref{sec:nice}.
```

Look at **?** in the document or inside the logs

38 Nice section

$$y = \frac{x+1}{b} \tag{3}$$

We have a nice equation (**??**) on page **??** inside the section 38.

Counter domination

look at the equation numbering style

```
\usepackage{amsmath}
\numberwithin{equation}{section} % Number
↪  equations within sections
\begin{document}
    \section{Nice section
    ↪  \label{sec:nice}}
    \begin{equation}
         y=\frac{x+1}{b} \label{niceeq}
    \end{equation}
    We have a nice equation (\ref{niceeq})
    ↪  on page \pageref{niceeq} inside
    ↪  the section \ref{sec:nice}.
\end{document}
```

38 Nice section

$$y = \frac{x+1}{b} \tag{38.1}$$

We have a nice equation (38.1) on page 7 inside the section 38.

Bibliography

How to cite

Use `\cite{label}`

```
As it was written in Landau
↪  \cite{landau}...

\bibliographystyle{plain}
\bibliography{cites}
```

As it was written in Landau [1]...

As it was written in Landau [1]...

References

[1] L. D. Landau and E. M. Lifshitz. *The Classical Theory of Fields*. Butterworth-Heinemann, 4 edition, January 1980.

Bibliography

What to cite

.bib files

```
@Book{landau,
    author = {Landau, L. D. and Lifshitz, E. M.},
    title = {The Classical Theory of Fields},
    journal = N,
    volume = {1},
    pages = {140},
    year = 1980
}
```

You can have multiple records in one .bib file.

Offline - compile twice!

Running LaTeX offline, you can get **(??)** in `\ref` and **[?]** in `\cite`.
For

- References
- Bibliography
- Table of content
- Indexing
- ...

LaTeX collect addition data in extra files. LaTeX need more then one run to get this data.
Use `latex; bibtex; latex; latex`

Bibliography. Where can you get .bib files?

- Just google it! “article_name bibtex”
- at scholar.google.ru ask Cite -> BibTeX
- Go to your favorite journal and look at Citations -> “.bib” or “bibtex”
- Ask Mendeley, Zotero or other programs to give you the .bib file
- Create it by yourself

Bibliography. Creating .bib file

`@article`	Journal or magazine article
`@book`	Book
`@conference`	Article in conference proceedings
`@misc`	If nothing else fits.

Than fill in
- author
- title
- journal
- year
- pages
- volume

following the example of other entries

Bibliography_Management#Standard_templates for cite url checkout /3587/how-can-i-use-bibtex-to-cite-a-web-page

check for full list Bibliography_Management#BibTeX

What we will know?

\footnote

```
Hello. How\footnote{And where?} are
↪  you\footnote{yes, you}?
```

Hello. How[1] are you[2]?

[1] And where?
[2] yes, you

Horizontal aligment

```
AA BB VV GG
\begin{flushright}
AA BB VV GG
\end{flushright}
{\raggedleft AA BB VV GG\par}


\begin{center}
     AA BB VV GG
\end{center}
{\centering AA BB VV GG\par}
\centerline{AA BB VV GG}

\begin{flushleft}
     AA BB VV GG
\end{flushleft}
{\raggedright AA BB VV GG \par}
```

AA BB VV GG

AA BB VV GG

AA BB VV GG

AA BB VV GG

AA BB VV GG
AA BB VV GG

AA BB VV GG

AA BB VV GG

man: 8.12 man: 8.13 kn: 14 and note /64644/centering-doesnt-seem-to-center-my-text

Page break

```
\newpage \pagebreak
```


man: 10 /736/pagebreak-vs-newpage

Quotes

```
As Vladimir Lenin said,
\begin{quote}
     The main problem of quotes on the
     ↪  Internet is that people
     ↪  immediately believe in their
     ↪  authenticity.
\end{quote}
(1614 year)
```

As Vladimir Lenin said,

> The main problem of quotes on the Internet is that people immediately believe in their authenticity.

(1614 year)

lv: III.7.1 man: 8.20. Also see `quotation` env

Verses

```
\begin{verse}
\obeylines
There was a young fellow named Hall
Who fell in the spring in the fall.
'Twould have been a sad thing
Had he died in the spring,
But he didn’t - he died in the fall.
\end{verse}
```

There was a young fellow named Hall
Who fell in the spring in the fall.
’Twould have been a sad thing
Had he died in the spring,
But he didn’t – he died in the fall.

Marginal notes

```
\noindent Hello, guys!\par
\noindent Sometimes you need to put a node
↪  -- ``Marginal'' \marginpar{!!!} ---
↪  and \LaTeX\ has a simple way to do it
```

Hello, guys!
Sometimes you need to put
a node – “Marginal” — and !!!
LaTeX has a simple way to
do it

What we will know?

Technical agreements

Document Creation

Presentation Creation

Beamer

What is Beamer?

Beamer is a LaTeX document class for creating slides for presentations.
It supports pdflatex, latex+dvips, lualatex and xelatex.

Beamer

What is Beamer?

Beamer is a LaTeX document class for creating slides for presentations.

It supports pdflatex, latex+dvips, lualatex and xelatex.

https://ctan.org/pkg/beamer

What we will know?

- Presentation Creation
  - Document structure and style
  - Tricks: overlays, animation, notes

Simplest Beamer document

```
\documentclass{beamer}

\begin{document}
\begin{frame}{Frame title}
    Frame content.
\end{frame}

\end{document}
```

`label=simple` at begin frame allows to get to the frame by `\hyperlink`command

Beamer document structure

like in regular document!

```
\documentclass{beamer} % [aspectratio=169] for wider slides!
% Preamble: encoding, theme, colortheme, title, etc.
\begin{document}
    \frame{\titlepage}
    % N.B.: \frame{\titlepage} is the same as
    %   \begin{frame} \titlepage \end{frame}

    \section{Section name}
    \subsection{Subsection name}
    \begin{frame}{Summary}
        ...
    \end{frame}

    \appendix
    \begin{frame}{References}
        ...
    \end{frame}
\end{document}
```


You can also use `\frame` command

Title page (Preamble)

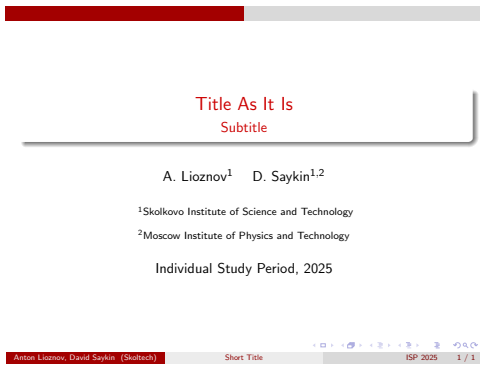
like in regular document!

```
\title[Short Title]{Title As It Is}
\subtitle{Subtitle}

\author[Anton Lioznov, David Saykin]
{A.~Lioznov\inst{1} \and
↪  D.~Saykin\inst{1,2}}

\institute[Skoltech]{
  \inst{1} Skolkovo Institute of Science
  ↪  and Technology
  \and
  \inst{2} Moscow Institute of Physics and
  ↪  Technology}

\date[ISP 2025]{Individual Study Period,
↪  2025}
```



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Built–in themes

```
\usetheme{CambridgeUS}
\usecolortheme{crane}
```

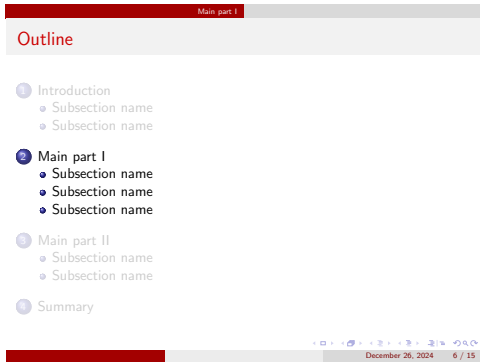
https://hartwork.org/beamer-theme-matrix/

Built–in themes

```
\usetheme{CambridgeUS}
\usecolortheme{crane}
```
https://hartwork.org/beamer-theme-matrix/
```
\usefonttheme{structureitalicserif}
```
http://deic.uab.es/~iblanes/beamer_gallery/index_by_font.html

TOC (AtBeginSection[])

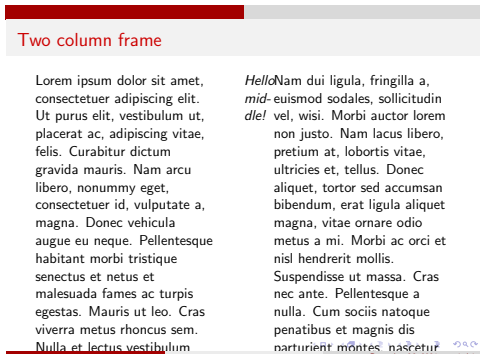
```
\AtBeginSection[]{
    \begin{frame}{Outline}
        \tableofcontents[currentsection]
    \end{frame}
}
```



Frame: Columns

```
\begin{columns}[t]
    \begin{column}{0.4\textwidth}
        \lipsum[1]
    \end{column}
    \begin{column}{0.1\texwidth}
        \textit{Hello middle!}
    \end{column}
    \begin{column}{0.4\textwidth}
        \lipsum[2]
    \end{column}
\end{columns}
```

([t] for “top” align)



Colors

LaTeX provides several standart colors: red, blue, green,...

```
\textcolor{red}{text}
```

Colors

LaTeX provides several standart colors: red, blue, green,...
`\textcolor{red}{text}`
There many ways to define new colors, e. g. `\definecolor{orange}{rgb}{1,.5,0}`
`\definecolor{orange}{RGB}{255,127,0}`

Colors

Beamer automatically loads xcolor package
Somehow popular way to define new colors is by the following rule

color	rgb formula	output
red!30!blue	.3(1,0,0)+.7(0,0,1)	example
red!30	.3(1,0,0)+.7(1,1,1)	example
red!30!blue!50!green	.5(red!30!blue)+.5(0,1,0)	example

Blocks & Header customisation

```
\begin{frame}
     \begin{block}{Title}
          body
     \end{block}

    \setbeamercolor{block
    ↪  title}{bg=blue!90,fg=white}
    \setbeamercolor{block
    ↪  body}{bg=blue!40!,fg=black}

    ↪  \setbeamertemplate{blocks}[rounded][sh
    \begin{block}{Colored title}
          colored body
     \end{block}
\end{frame}
```

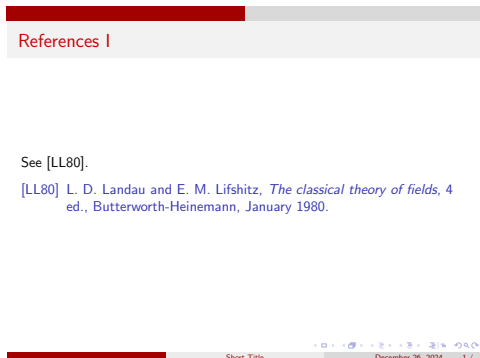
Appendix

```
\usepackage{appendixnumberbeamer}
\begin{document}
    \frame{Something}

    \appendix
    \section{\appendixname}
    \subsection{Additional materials}

    \frame{\tableofcontents}
\end{document}
```

(notice frame numbers!)

Bibliography (bibtex)

```
\begin{frame}[allowframebreaks]{References}
    See \cite{landau}.

    \bibliographystyle{amsalpha}
    \setbeamertemplate{bibliography
    ↪  item}[text]
    \bibliography{cites}
```



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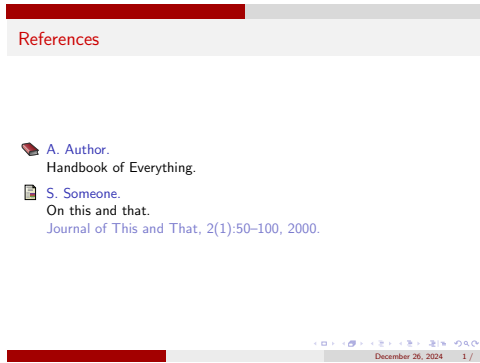
Bibliography (simple)

```
\begin{frame}{References}
  \begin{thebibliography}{10}
      \beamertemplatebookbibitems
      \bibitem{Author1990}
        A.~Author.
        \newblock Handbook of Everything.
      \beamertemplatearticlebibitems
      \bibitem{Someone2000}
        S.~Someone.
        \newblock On this and that.
        \newblock Journal of This and
        ↪  That, 2(1):50--100, 2000.
  \end{thebibliography}
```



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What we will know?

- Presentation Creation
  - Document structure and style
  - Tricks: overlays, animation, notes

Stepwise viewing: \pause

The main command to create pauses is \pause

Stepwise viewing

Command \pause

\onslide command tells to show material from the first slide.

Stepwise viewing

Command \pause is the simplest way to create an overlay.

\onslide command tells to show material from the first slide.

man: sec 9.1

Stepwise viewing

Command \pause is the simplest way to create an overlay.

$$\zeta(s) = \sum_{k=1}^{\infty} \frac{1}{k^s}, \quad \operatorname{Re} s > 1.$$

\onslide command tells to show material from the first slide.
\onslide<3-> tells to show material from the third slide on.

Stepwise viewing

Command \pause is the simplest way to create an overlay.

$$\zeta(s) = \sum_{k=1}^{\infty} \frac{1}{k^s}, \quad \operatorname{Re} s > 1.$$

\onslide command tells to show material from the first slide.
\onslide<3-> tells to show material from the third slide on.
\pause command then leads to the next slide.

Stepwise viewing

Most of the commands are self–explanatory.
\pause<#> — following text shown only after slide #
\onslide<#> — visible only slide #
\FromSlide{#} — equivalent to \onslide<#->.
\only<#> — visible on particular slides, otherwise absent
\uncover<#> — visible on particular slides, otherwise transparent
\visble<#> — visible on particular slides, otherwise invisible
\invisble<#> — opposite of \visble<#>.

Overlays

Overlay specifications can also be written together with some commands like `\textbf`, `\item`, `\color`, `\alert`.

Overlays

Overlay specifications can also be written together with some commands like \textbf, \item, \color, \alert.

```
\begin{enumerate}
    \item<1-> Every \alert<3>{thing}
    \item<only@3,4> that has
    \item<2-> beginning
    \item<1,4> has end.
\end{enumerate}
```

Overlays

1. Every thing

4. has end.

Overlays

1. Every thing
3. beginning

Overlays

1. Every thing
2. that has
3. beginning

Overlays

1. Every thing
2. that has
3. beginning
4. has end.

Overlays

- Every thing

Overlays

- Every thing
- that has

Overlays

- Every thing
- that has
- beginning

Overlays

- Every thing
- that has
- beginning
- has end.

Animation

- Every thing
- that has
- beginning
- has end.

Animation

- Every thing
- that has
- beginning
- has end.

Animation

- Every thing
- that has
- beginning
- has end.

Animation

- Every thing
- that has
- beginning
- has end.

Animation

- Every thing
- that has
- beginning
- has end.

Cool, right?

Animation

```
\animate<1-4>
\begin{itemize}[<+->]
    \item Every thing
    \item that has
    \item beginning
    \item has end.
\end{itemize}
```

Animation

```
\transduration<1-4>{.5}
\begin{itemize}[<+->]
    \item Every thing
    \item that has
    \item beginning
    \item has end.
\end{itemize}
```

What we have learned today?

Technical agreements

Document Creation
- Structural elements
- References
- Useful commands

Presentation Creation
- Document structure and style
- Tricks: overlays, animation, notes

references I

color from the footnotes corresponds to references' color.

- kn: Knuth "The TEXBook"
- lv: L'vovsky "Nabor i verstka v sisteme LATEX"
- lamport: Lamport. "LATEX. A Document Preparation System, User's Guide and Reference Manual"
- man: "LATEX2e: An unofficial reference manual" also at website https://latexref.xyz/
- : https://tex.stackexchange.com/questions
- : https://en.wikibooks.org/wiki/LaTeX
- : https://www.overleaf.com/learn/latex
- : https://www.tug.org/utilities/plain/cseq.html

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