

# MiK<sub>E</sub>X and L<sub>A</sub>T<sub>E</sub>X Introduction

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<http://www.win.tue.nl/~marko/latex/intro/>

$\text{\LaTeX}$  is a document preparation system. It is widely used in the fields of mathematics and natural sciences, but also spreading to many other disciplines.

- $\text{\LaTeX}$  is a set of markup commands used with the powerful typesetting program  $\text{\TeX}$ .
- totally open software system, free of charge.
- platform independent.

$\text{\LaTeX}$  is no word processor!  $\text{\LaTeX}$  stimulates placing emphasis on content (logical markup) instead of appearance (typographical markup).

## MiK<sub>E</sub>X

$\text{\LaTeX}$  is platform independent and runs on every operating system.

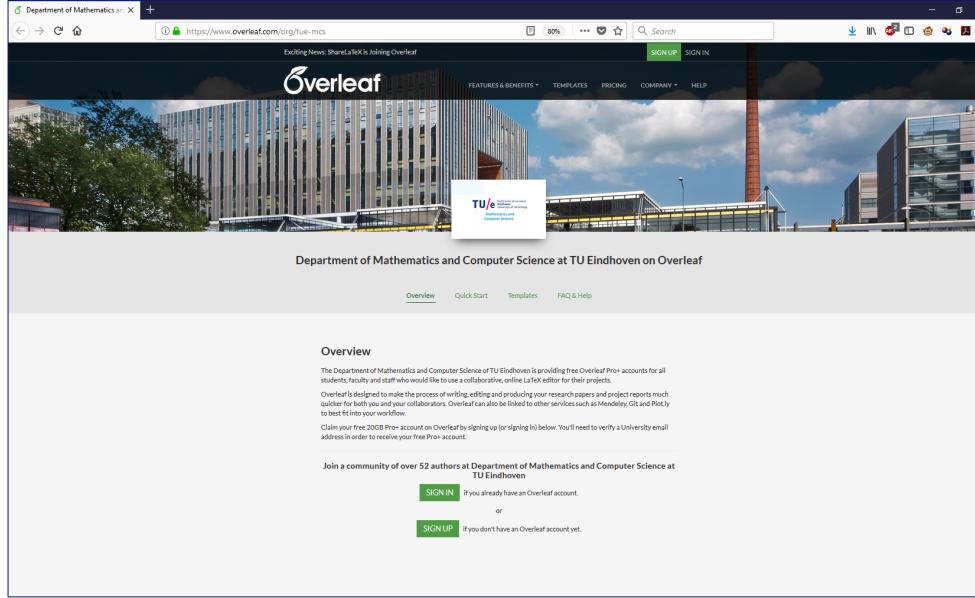
MiK<sub>E</sub>X is an implementation of  $\text{\LaTeX}$  for Windows.

TU/e Installation MiK<sub>E</sub>X 2.9 from TU/e network or with VPN:

- Official TU/e software site  
<https://intranet.tue.nl/en/university/services/ict-services/help-and-support/software-tue-device/>
- network drive \\winstorage\\miktex\\miktex29\\
- network drive \\pcwin1318\\miktex29\\ (temporary)

More detailed instructions: see the dedicated page in Canvas.

## Overleaf



Overleaf is a popular free cloud solution for writing  $\text{\LaTeX}$  documents, in particular useful when collaborating together with multiple co-authors. At our department we have a license for employees and students. You can access our TU/e Math & CS Overleaf installation here:

<https://www.overleaf.com/edu/tue-mcs>

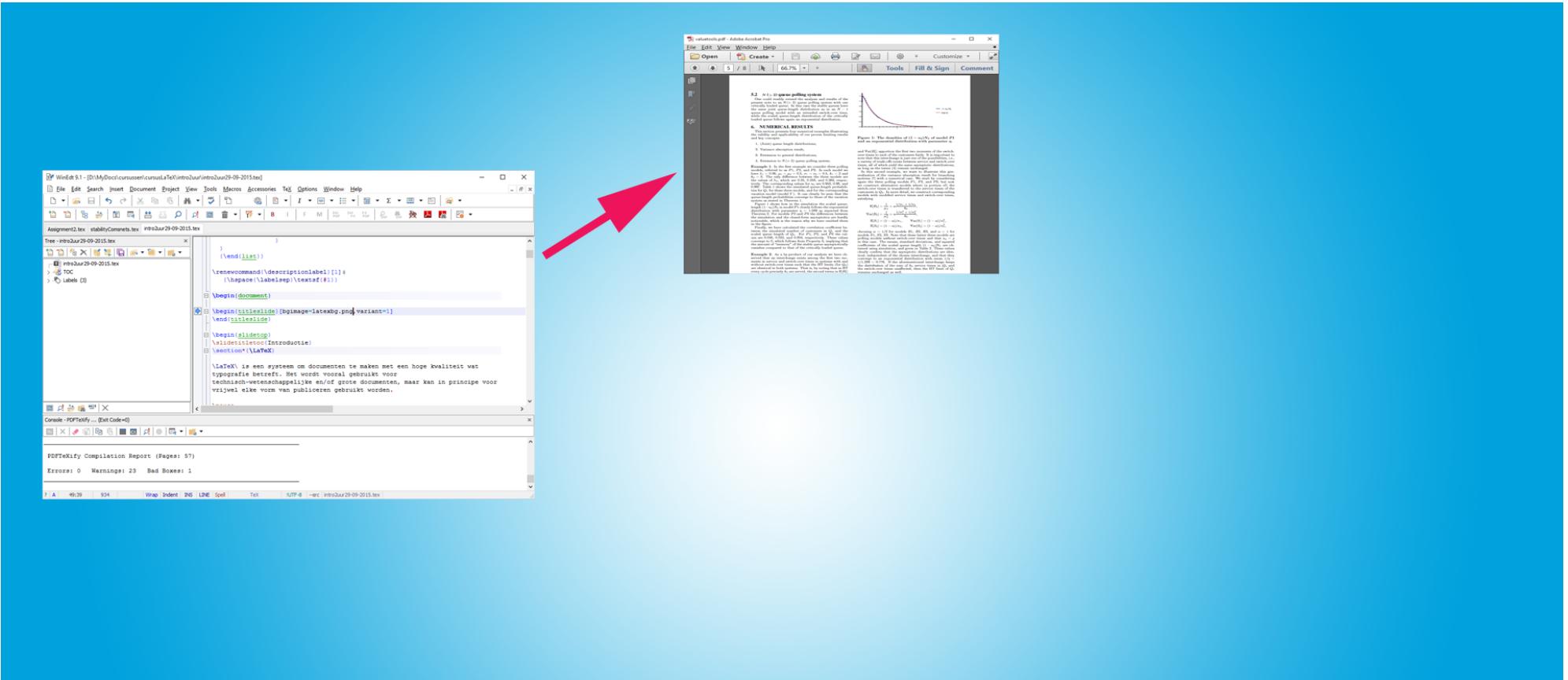
The screenshot shows a Windows 8.1 desktop with a LaTeX editor window open. The title bar reads "Widgit S1 - (D:\My Documents\curriculum\curricula\Te\introduction\intro29-09-2015.tex)". The menu bar includes File, Edit, Search, Insert, Document, Project, View, Tools, Macros, Accessories, Help. The toolbar has icons for file operations like Open, Save, Print, and zoom. The left sidebar shows a tree view of files: "Tree - intro29-09-2015.tex", "Assignment2.tex", "stabilityComments.tex", "intro29-09-2015.tex", "TOC", and "Labels (0)". The main text area contains LaTeX code:

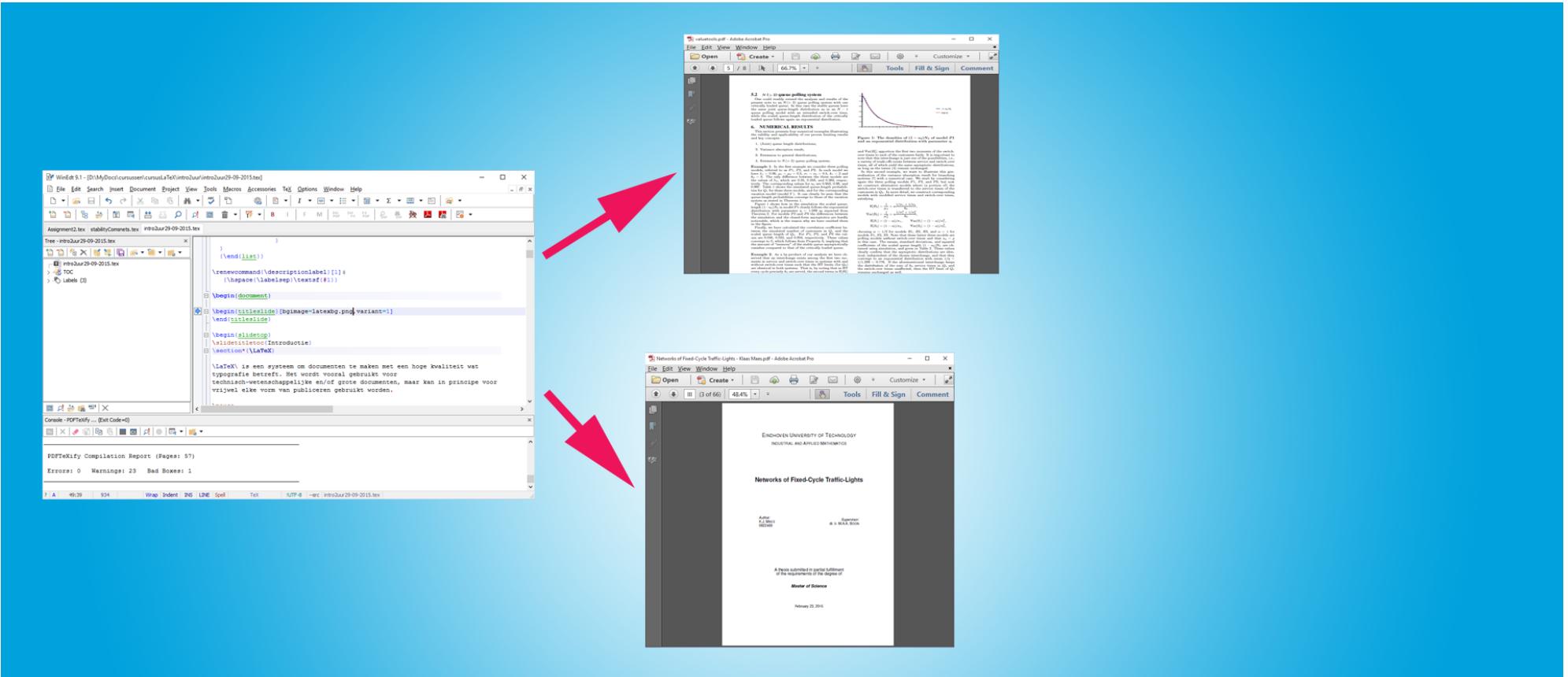
```
\begin{list}{}
  \end{list}
  \newcommand{\descriptionlabel}[1]{}
  \begin{document}
  \begin{titlepage}
  \begin{center}
  \begin{tikzpicture}
  \begin{frame}
    \begin{minipage}{0.45\textwidth}
      \begin{center}
        \textbf{LaTeX}
          

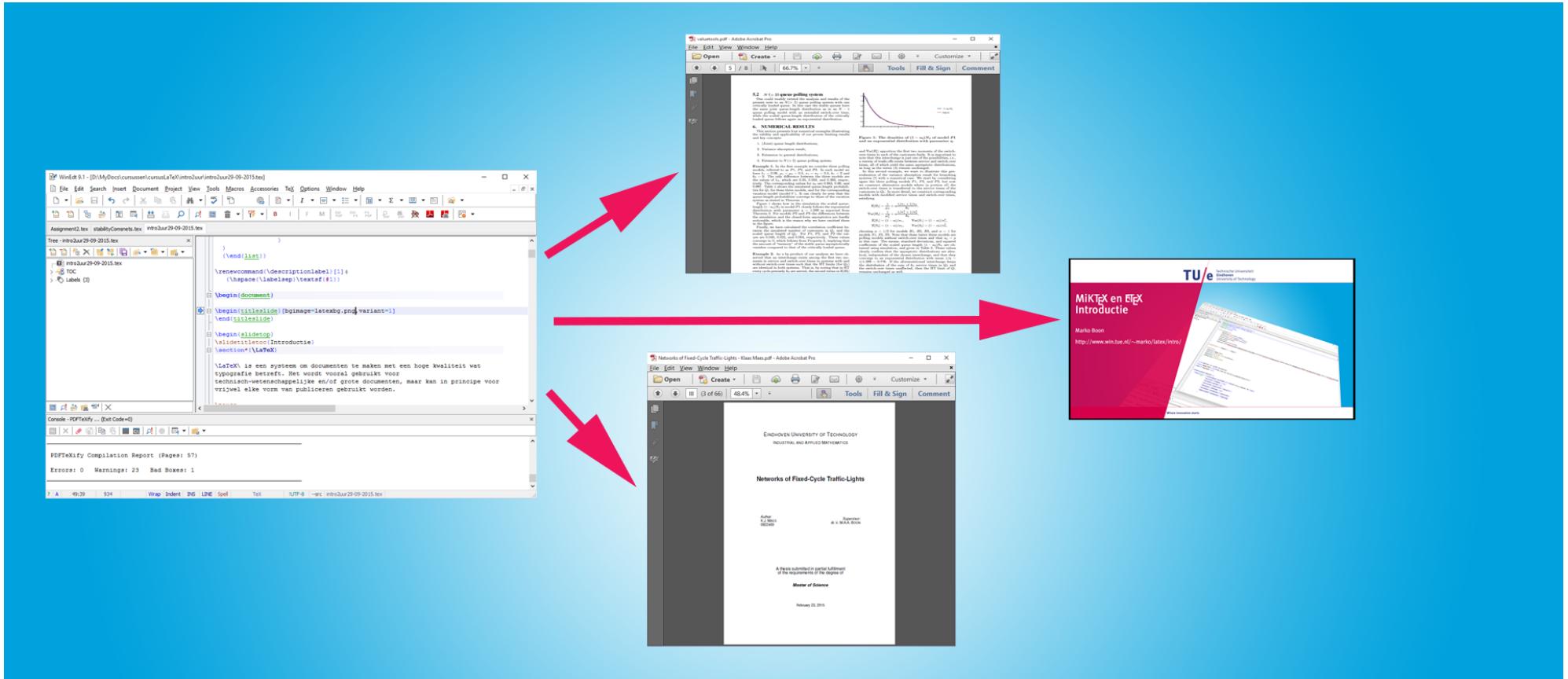
        is een systeem om documenten te maken met een hoge kwaliteit wat
        typografie betreft. Het wordt vooral gebruikt voor
        technisch-wetenschappelijke en/of grote documenten, maar kan in principe voor
        vrijwel elke vorm van publiceren gebruikt worden.
      \end{center}
    \end{minipage}
  
  \end{tikzpicture}
  \end{center}
  \end{titlepage}
  \begin{section}{Introduc}
  \end{section}
  \begin{section}{LaTeX}
  LaTeX is een systeem om documenten te maken met een hoge kwaliteit wat
  typografie betreft. Het wordt vooral gebruikt voor
  technisch-wetenschappelijke en/of grote documenten, maar kan in principe voor
  vrijwel elke vorm van publiceren gebruikt worden.
  \end{section}

```

The status bar at the bottom shows "A 49:39 934 Wrap Indent ING LINE Spell Tel UTF-8 --src intro29-09-2015.tex".







## The $\text{\LaTeX}$ language

- $\text{\LaTeX}$  commands always start with a backslash: \
- required command arguments are placed between curly brackets: { }
- optional command arguments are placed between brackets: [ ]
- comments start with a percentage symbol: %
- $\text{\LaTeX}$  takes care of the spacing between words and paragraphs (just like HTML).
- the commands **\begin{ }**  and **\end{ }**  create environments.

## A .tex file

```
\documentclass[options]{document_class}

% preamble

\begin{document}

% document

\end{document}
```

## A .tex file: intro.tex

```
\documentclass[a4paper,11pt]{article}
\usepackage{a4wide}
\usepackage[english]{babel}

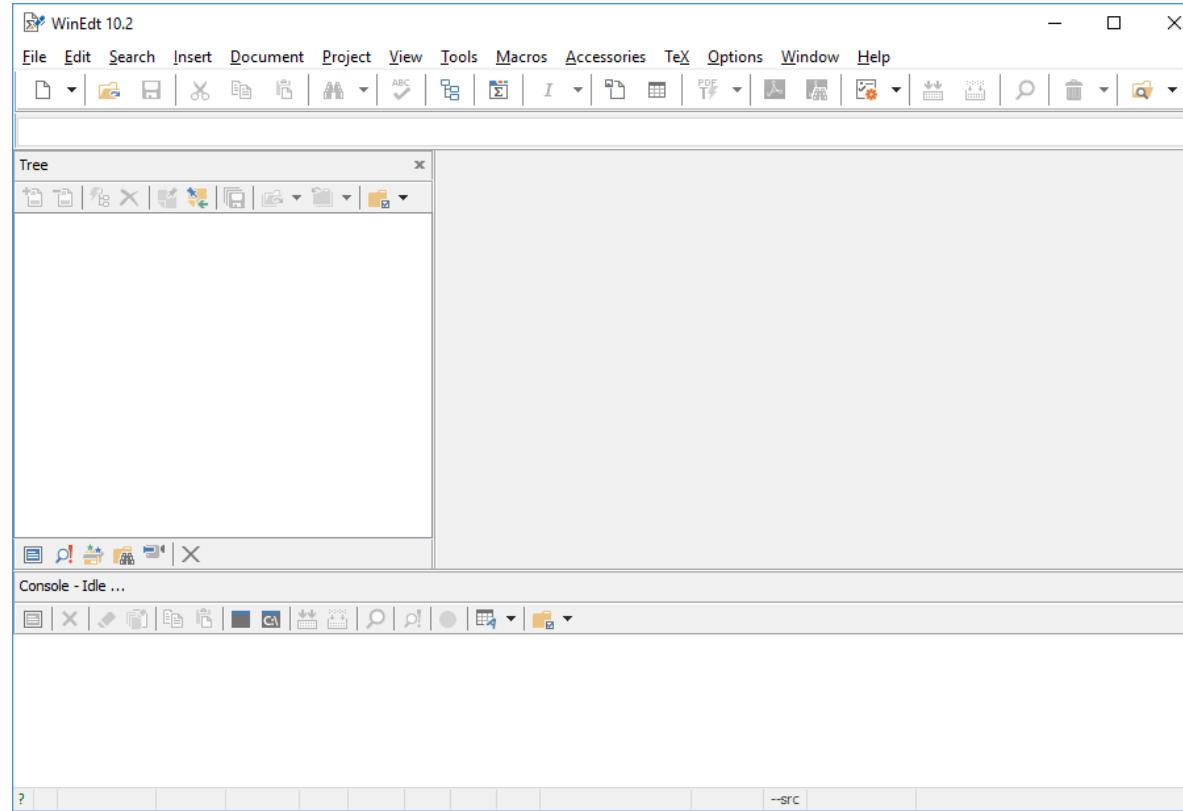
\begin{document}
\section{Introduction}
```

LaTeX is a document preparation system used to create documents of high quality typography.

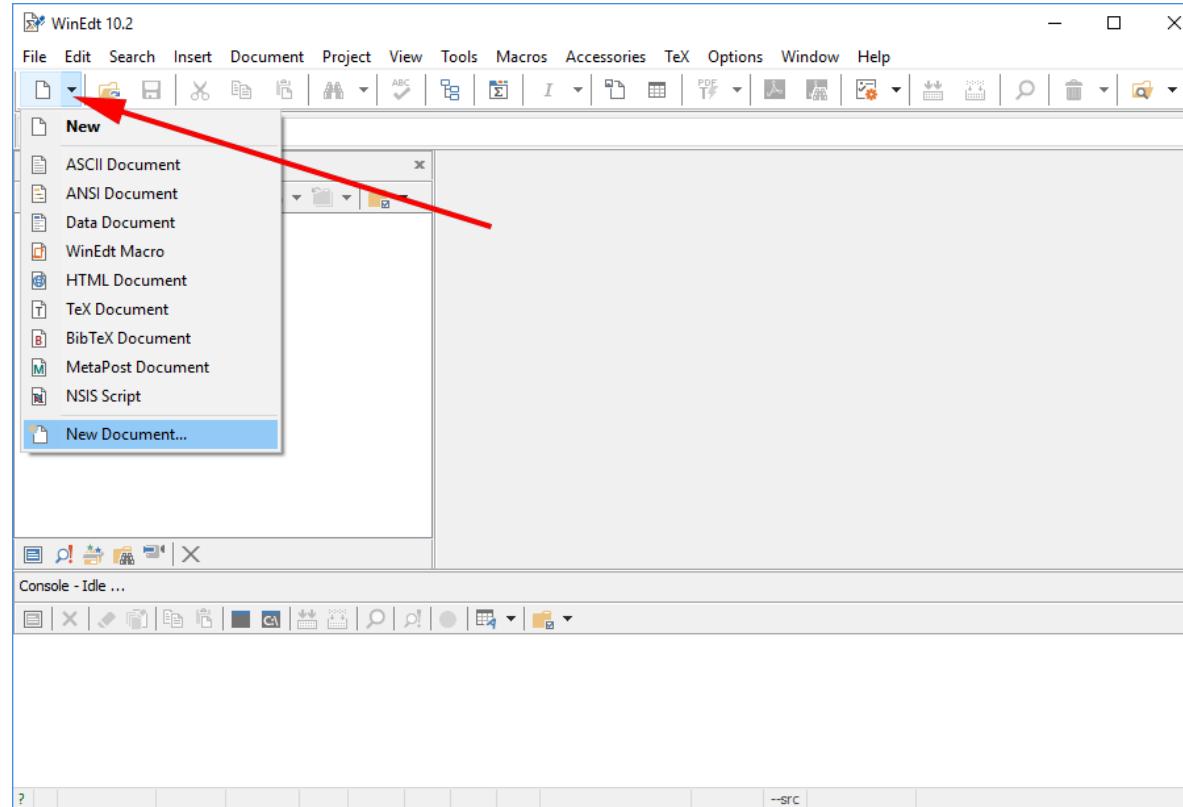
It is mostly used in the fields of mathematics and natural sciences, but can in fact be used for any type of publication.

```
\end{document}
```

## WinEdt

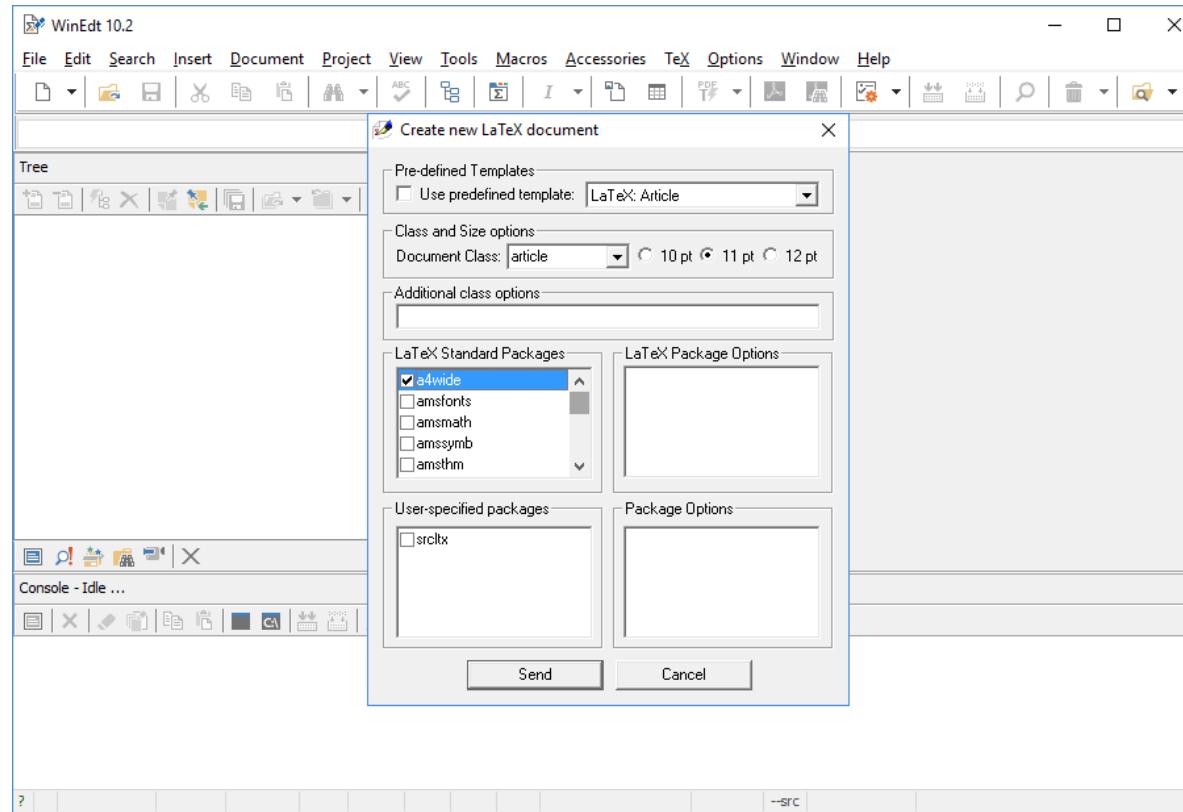


## WinEdt



**CTRL + SHIFT + N**

## WinEdt



## Frequently used packages

Packages are loaded in the preamble. A package is a set of L<sup>A</sup>T<sub>E</sub>X commands (or symbols, environments, declarations) stored in a file with the extension .sty. Important packages:

`a4wide` uses smaller page margins, which means that more text fits on one page.

`amsmath` contains advanced mathematical symbols.

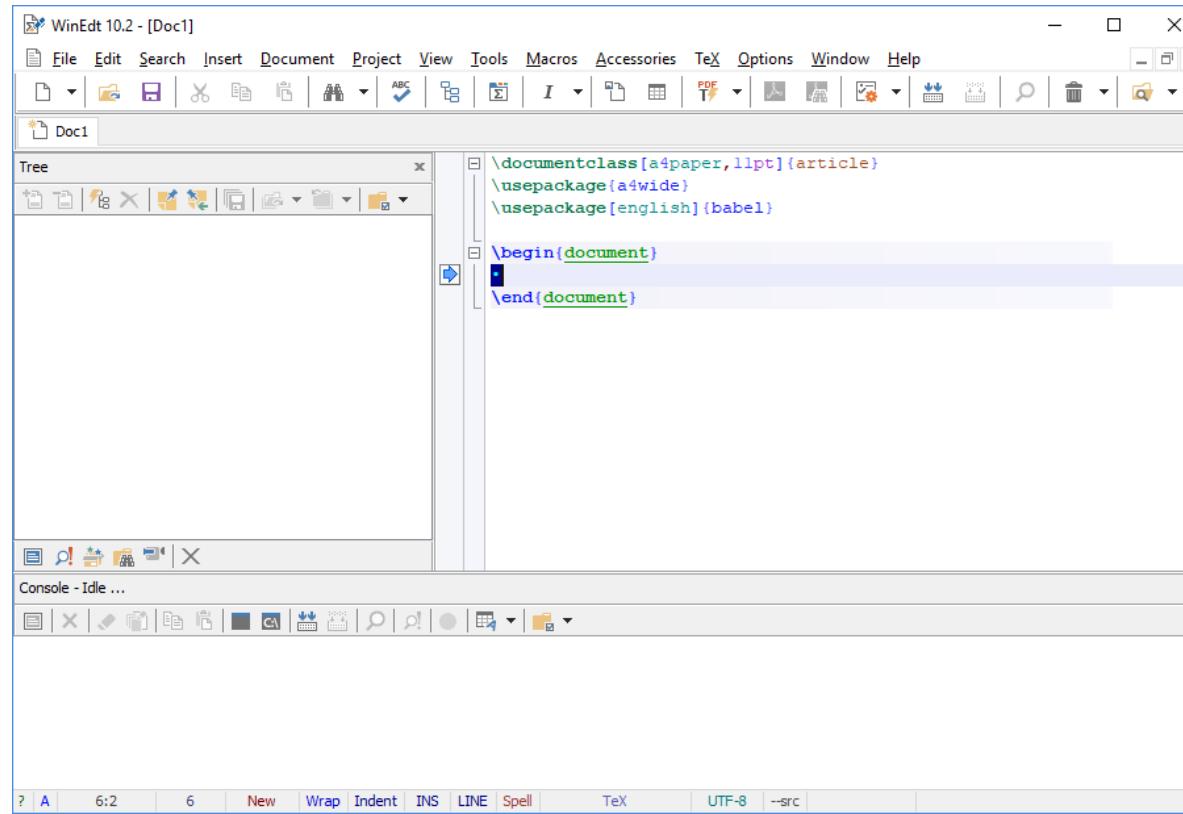
`babel` loads hyphenation rules for foreign languages.

`eurosym` loads the Euro symbol: €

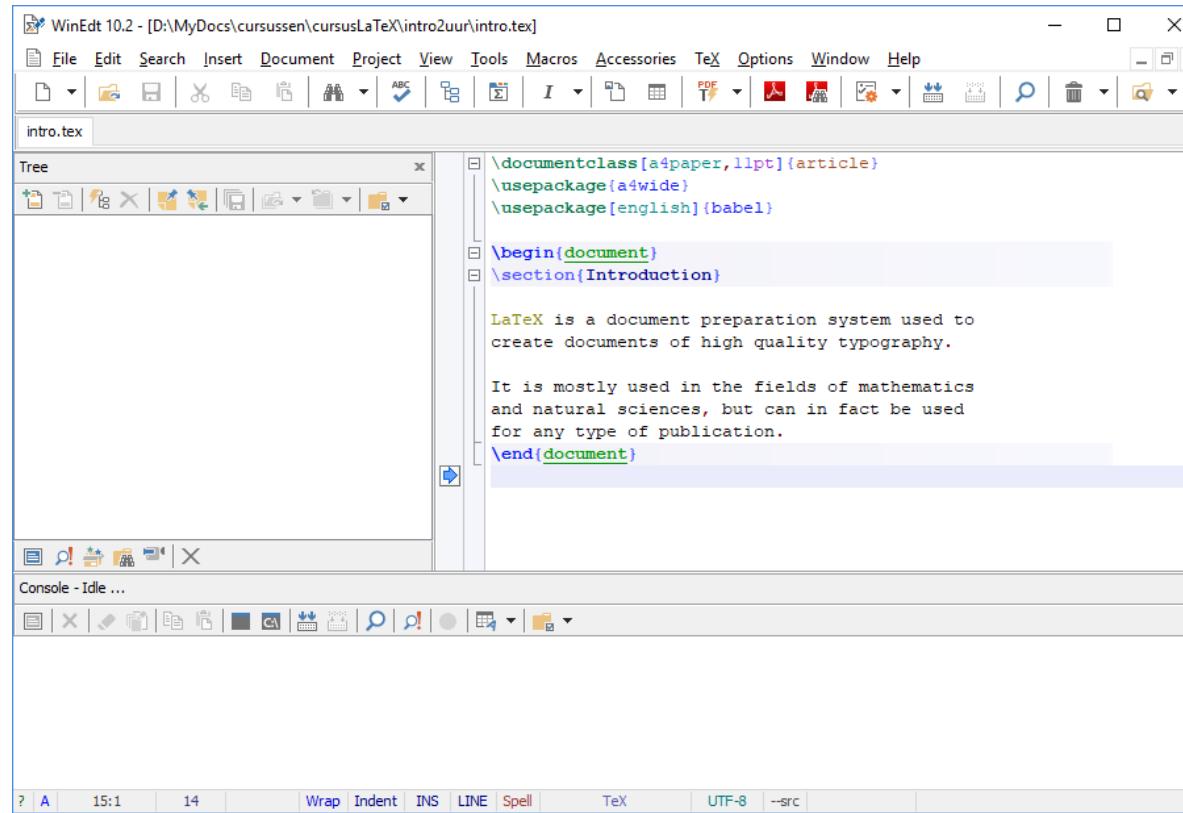
`graphicx` defines a command to load external graphics.

`listings` inserting source code with syntax highlighting

## WinEdt



## WinEdt





PDFify: compiles  $\text{\LaTeX}$  to PDF (CTRL + SHIFT + P, or F9)



opens Adobe Reader (Shift+F8)



inserts a picture.

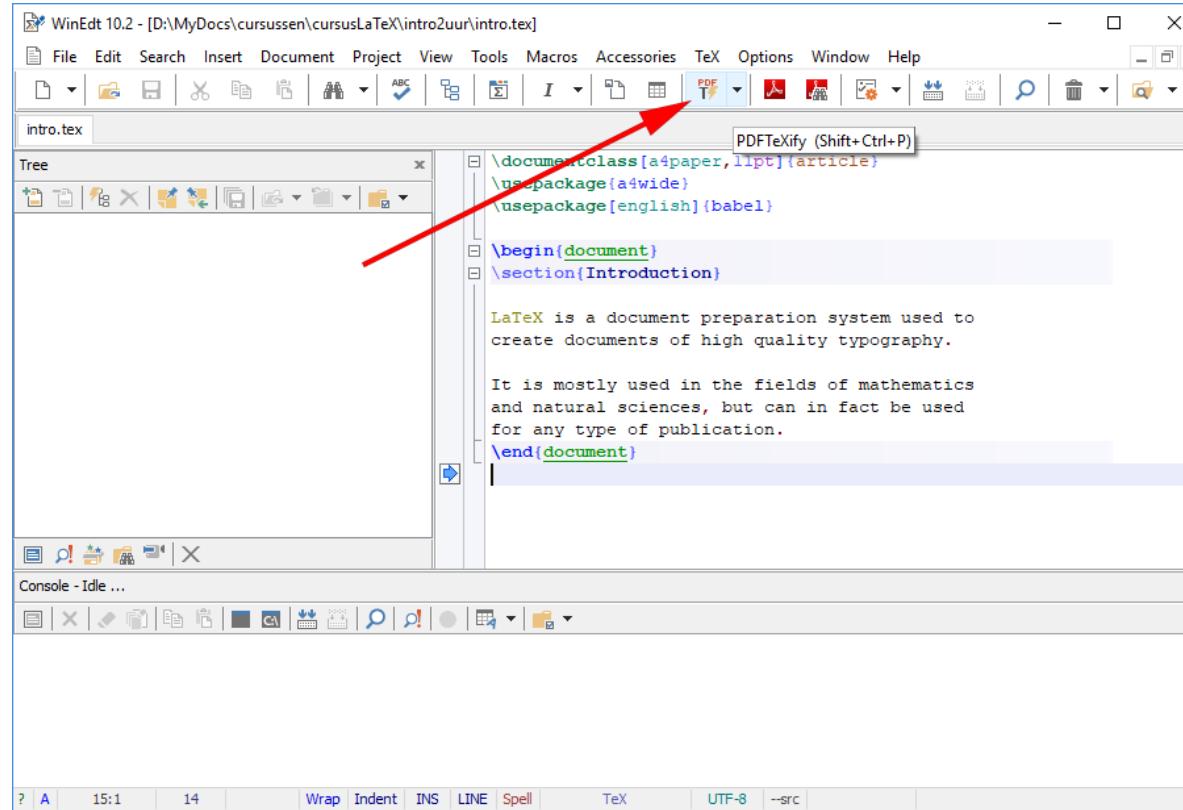


inserts a table.

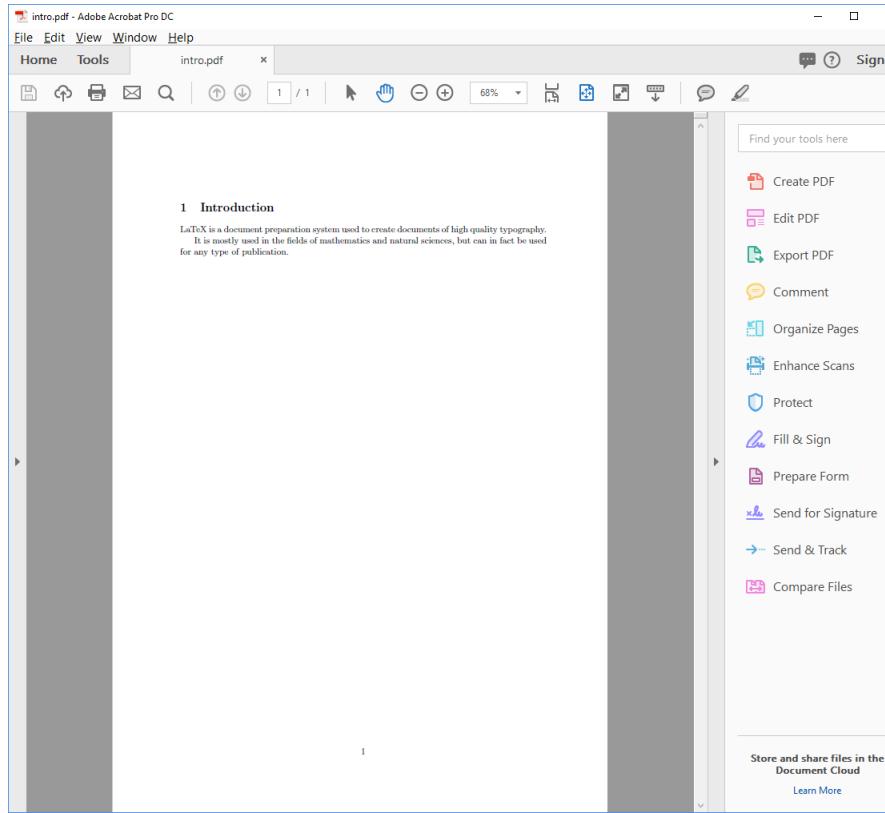


shows panels with mathematical symbols.

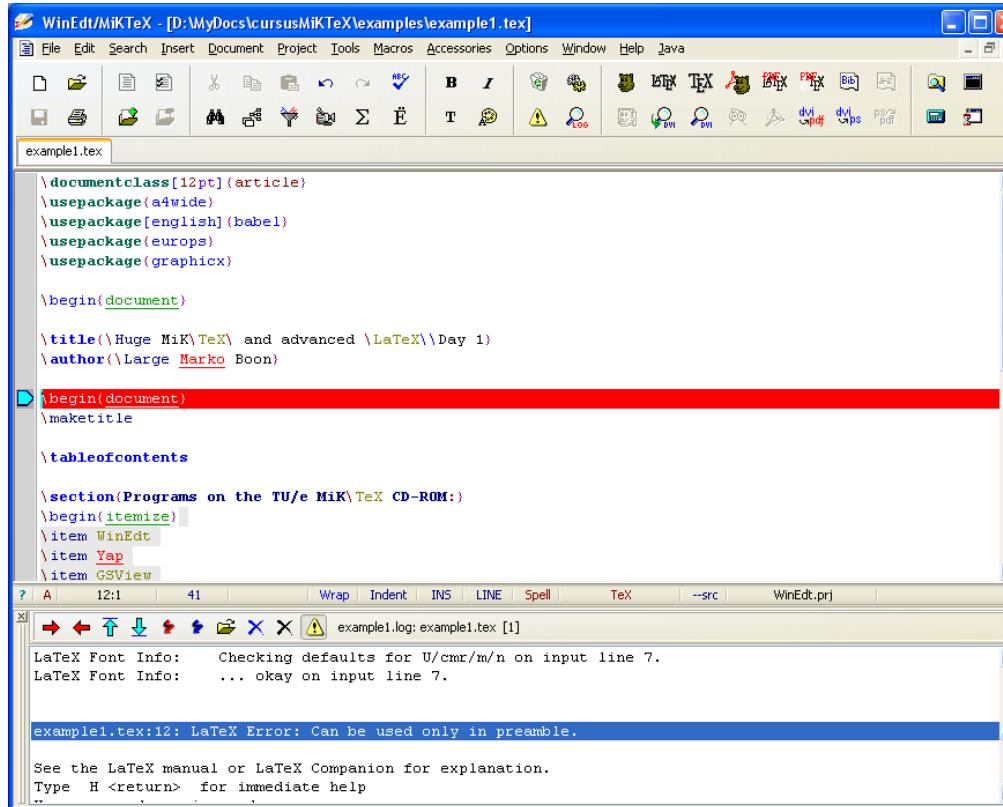
## WinEdt



## Adobe Acrobat Reader / Adobe Acrobat Pro

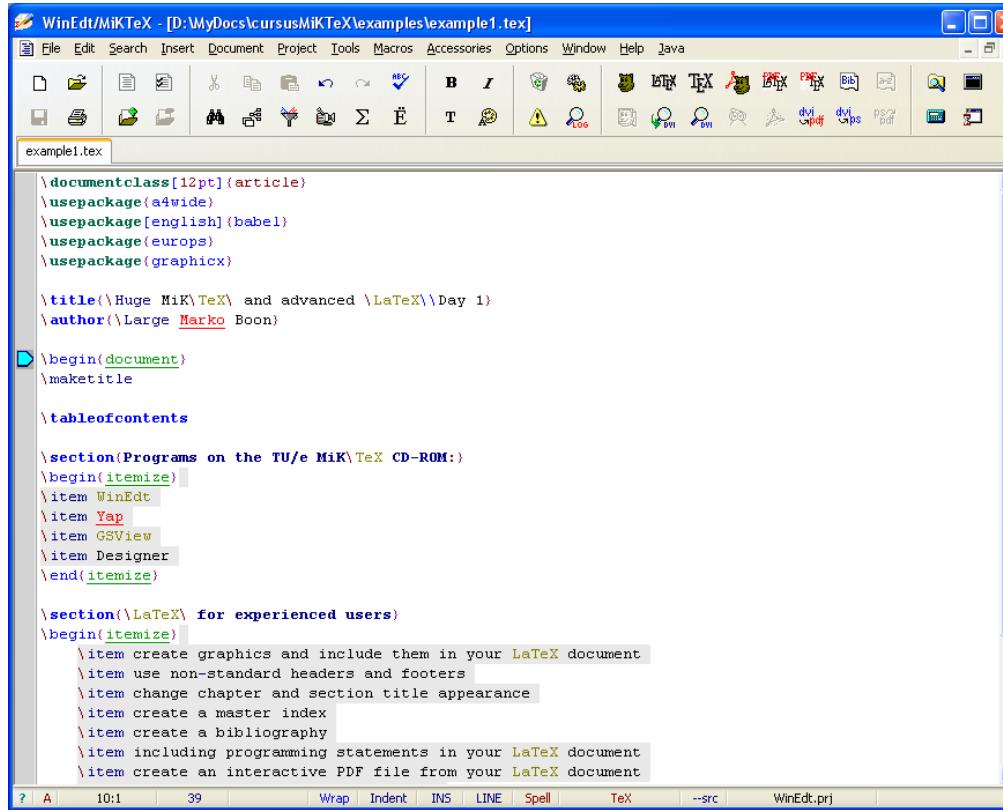


## WinEdt



## Mathematical and international symbols

## WinEdt



A *command* is an instruction to L<sup>A</sup>T<sub>E</sub>X to do something special. Three types of command names:

- the single characters # \$ & ~ \_ ^ % { } all have special meaning
- to print one of these characters, precede it with a backslash: \\$ \# \%
- the backslash character \ plus a sequence of letters, ending with the first non-letter:  
**\large \Large \bfseries**

Some commands have a so-called \*-form to modify their functionality somehow. Example:

```
\section*{Introduction}
```

Many commands operate on some piece of text, which then appears as an *argument* in curly braces following the command name. Examples:

```
\section{Introduction}
```

```
\textbf{bold text}
```

```
\begin{document}
```

Optional arguments are put into square brackets and mandatory arguments into curly brackets:

```
\documentclass[11pt]{article}
```

```
\usepackage[dutch]{babel}
```

## Environments

An *environment* affects the text within it treating it differently according to the environment parameters.

This text will not appear centered.

```
\begin{center}
```

This text will appear centered.

This text will appear centered.

This text will appear centered.

```
\end{center}
```

This text will not appear centered.

## Declarations

A *declaration* is a command that changes the values or meanings of certain parameters or commands without printing any text. The effect ends when another declaration of the same type is encountered.

This text appears normal while \bfseries this text appears boldface.

When the declaration occurs within an environment or within a { } block, its scope extends only to until the end of this environment or block.

This text appears normal while {\bfseries this text appears boldface}. This text is normal again.

\begin{center}

\bfseries

This text appears bold.

\end{center}

This text is normal again.

## Special Characters – Accents

Diacritical marks or accents can be created with L<sup>A</sup>T<sub>E</sub>X:

```
\`e \^e \~o \~o \=o \v{s} \c{c}
```

be\"invloeden

het re\"ele deel

Cura\c{c}ao

è é ô ö õ ö š ç

beïnvloeden

het reële deel

Curaçao

## Special Characters

Special symbols can be entered directly, but only if the right input encoding is specified. The input encoding depends on the type and language of the operating system. We have to load the package `inputenc` to specify the correct encoding:

```
\usepackage [utf8] {inputenc}
```

beïnvloeden, reëel, Curaçao  
€ f © ¥ §

beïnvloeden, reëel, Curaçao  
€ f © ¥ §

Please note that some of these characters also require the `textcomp` package. If you do not use WinEdt to create your  $\text{\LaTeX}$  documents, you might need another input encoding:

```
\usepackage [ansinew] {inputenc}
```

## The Euro Symbol: €

To use the € symbol, load the package **eurosym**. Now use the following command:

\euro

## Specifying the document language(s)

Load the package **babel** with the right arguments (dutch, english) to set the language:

```
\usepackage [english,dutch] {babel}
```

You can switch between languages in your document:

```
\selectlanguage{dutch}  
\today  
\selectlanguage{english}
```

## Parts of the Document – Title Page

```
\title{Title text}  
\author{Author names and addresses}  
\date{Date text}  
\maketitle
```

Use the **\and** command to define multiple authors:

```
\author{Marko Boon\\ marko@win.tue.nl \and  
Hans Sterk\\ h.j.m.sterk@tue.nl}
```

Use **\date{ }**  to omit the date.

## Sections and chapters

We can create chapters, sections, etc. using these commands:

\chapter{ }	\chapter*{ }
\section{ }	\section*{ }
\subsection{ }	\subsection*{ }
\subsubsection{ }	\subsubsection*{ }

Remarks:

- the command \chapter is only supported in book and report
- a \* behind the command, give the unnumbered version.

1. create a new  $\text{\LaTeX}$  article. Font size: 11pt. Load the package a4wide to adjust the margins.
2. open the web page <http://www.win.tue.nl/~marko/latex/intro/exercises/>
3. copy-paste the text from snowwhite.txt in the document body and run  $\text{\LaTeX}$ . Explain what the error message means and fix the error.
4. right before the error, a Euro symbol occurs. Verify that the symbol is not printed in the PDF file. Make sure that  $\text{\LaTeX}$  also prints the Euro symbol.
5. the last line (The End) should be large and centered.
6. create a title page.
7. create sections: Introduction, The evil stepmother, The great forest, The seven dwarfs, The murder of Snow White, The funeral, The prince, and The marriage.
8. create subsections: The cottage, The dwarfs, The encounter, First attempt, Second attempt, and Third attempt

## Parts of the Document – Abstract

The abstract is produced with the abstract environment:

```
\begin{abstract}  
Text for the abstract.  
\end{abstract}
```

In document class report the abstract appears on a separate page (without page number).

In document class article the abstract appears below the title.

## Parts of the Document – Appendix

An appendix is introduced with the declaration \appendix

- Resets the section/chapter counter
- Changes the numbering form from numerals to capital letters (A, B, ...)
- Replaces the word “Chapter” by “Appendix”.

## Table of Contents

The table of contents is generated and printed with the command `\tableofcontents` (usually after title page and abstract).

All entries are created automatically, based on the sectioning commands.

## Labels and References

The command `\label{marker}` stores the current value of the relevant counter (section, chapter, equation, figure, table etc.) at that point in the text.

To refer to a label, use:

`\ref` to print the section, chapter, equation, figure or table number.

`\pageref` to print the page number on which the `\label` command was issued.

```
\section{Labels and References}\label{labels}}
```

In section `\ref{labels}` you will find information on how to create labels and references in `\LaTeX`.

The sections starts on page `\pageref{labels}`.

## Mathematical environments:

- $\$ \dots \$$   
mathematics in a line of text (inline).
- $\backslash[ \dots \backslash]$   
mathematics in a separate paragraph.
- $\backslash\begin{equation} \dots \end{equation}$   
mathematics in a separate paragraph, including equation number.
- $\backslash\begin{eqnarray} \dots \end{eqnarray}$   
multiline mathematical equations, properly aligned.

## Example

Everybody knows that  $\sin \pi$  is equal to 0.

```
\begin{eqnarray*}
\lim_{x \rightarrow 0} \frac{\sin x}{x} &=& 1 \\
\sum_{k=0}^{\infty} x^k &=& \frac{1}{1-x} \quad (|x|<1)
\end{eqnarray*}
```

Everybody knows that  $\sin \pi$  is equal to 0.

$$\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$$

$$\sum_{k=0}^{\infty} x^k = \frac{1}{1-x} \quad (|x| < 1)$$

The environments `array` and `tabular` create tables and matrices. The usage of `array` is the same as for `tabular`, but it can only be used in math mode.

```
\begin{array} [pos] {cols}
  rows
\end{array}
```

```
\begin{tabular} [pos] {cols}
  rows
\end{tabular}
```

The `pos` argument defines the vertical positioning for the table: `t` or `b` (top or bottom)

Example:

```
\[
\left(
\begin{array}{ccc}
1 & 2 & 3 \\
4 & 5 & 6 \\
7 & 8 & 9
\end{array}
\right)
```

$$\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$$

The `cols` argument defines the column formatting. The possible formatting symbols are:

- | l the column contents are left justified
- | r the column contents are right justified
- | c the column contents are centered
- | p{width} the text in this column is set in a paragraph box of the specified width.
- || draws a vertical line
- ||| draws a double vertical line

The rows contain the actual entries. Each row is terminated with the `\\"` command. The column entries are separated by a `&` symbol.

The command `\hline` draws a horizontal line over the full width.

The command `\cline{m-n}` draws a horizontal line from the left of column  $m$  to the right of column  $n$ .

The command `\multicolumn{n}{c}{text}` creates a table cell that extends  $n$  columns. The column formatting for this cell is defined by `c`.

## Example 1

Eredivisie October 5, 2017							
		P	W	D	L	Pts	+/-
1	PSV	7	6	0	1	21:06	18
2	Feyenoord	7	5	0	2	16:06	15
3	Vitesse	7	4	2	1	15:07	14
4	Zwolle	7	4	2	1	13:10	14
5	Heerenveen	7	4	2	1	12:11	14
6	Ajax	7	4	1	2	15:06	13
7	VVV-Venlo	7	3	3	1	10:06	12
8	AZ	7	4	0	3	10:11	12
9	ADO	7	3	1	3	06:09	10
10	Utrecht	7	3	1	3	10:14	10
11	Heracles	7	2	2	3	11:13	8
12	Groningen	7	2	2	3	11:13	8
13	Excelsior	7	2	1	4	07:11	7
14	NAC	7	2	1	4	09:14	7
15	Twente	7	2	0	5	08:09	6
16	Sparta	7	1	2	4	05:11	5
17	Roda	7	1	0	6	07:17	3
18	Willem II	7	1	0	6	06:18	3

## Example 1

```
\begin{tabular}{|l|l|cccc|c|c|} \hline \multicolumn{8}{|c|}{Eredivisie October 5, 2017} \\ \hline & & P & W & D & L & Pts & +/- \\ \hline 1 & PSV & 7 & 6 & 0 & 1 & 21:06 & 18 \\ 2 & Feyenoord & 7 & 5 & 0 & 2 & 16:06 & 15 \\ \dots \\ 18 & Willem II & 7 & 1 & 0 & 6 & 06:18 & 3 \\ \hline \end{tabular}
```

## Example 2

Model	Description	Price
FBD 360	Desktop: XP3600+ Processor, 512 MB DDR-RAM, 80 GB Hard disk, 16x DVD drive, 32x CDRW drive, 64 MB TV output, Windows XP, 15" monitor	€999.00
FBD 480	Desktop DeLuxe: Same as FBD 360 but with XP4800+ Processor, 48x CDRW drive, 17" monitor	€1399.00

## Example 2

```
\begin{tabular}{lp{10cm}r}
\bfseries Model & \bfseries Description &
\bfseries Price \\[1ex]

FBD 360 & \small \textbf{Desktop}: XP3600+
Processor, 512~MB DDR-RAM, 80~GB Hard disk,
16x DVD drive, 32x CDRW drive, 64~MB TV output,
Windows~XP, 15" monitor & \euro 999.00 \\

FBD 480 & \small \textbf{Desktop DeLuxe}: Same
as FBD 360 but with XP4800+ Processor, 48x CDRW
drive, 17" monitor & \euro 1399.00 \\
\end{tabular}
```

## Excel to L<sup>A</sup>T<sub>E</sub>X Add-In

1. download the Excel macro: [Excel2LaTeX.xla](#)

2. Start Excel and install the Add-in:

- Click on the Office button (in the upper left corner)
- Excel Options
- Add-Ins
- Go...
- Browse...
- Browse for the Add-In and click Ok

3. Restart Excel

4. A button has been added to the Add-Ins tab: 

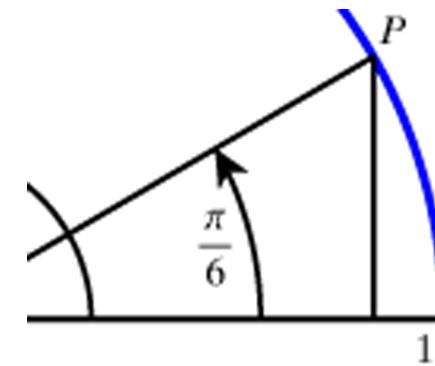
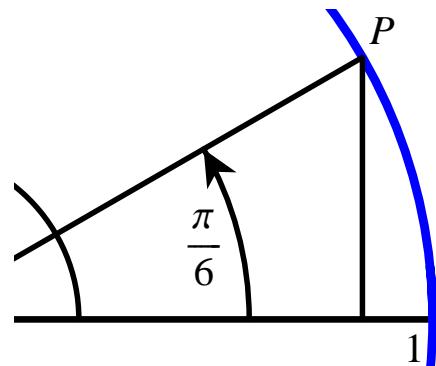
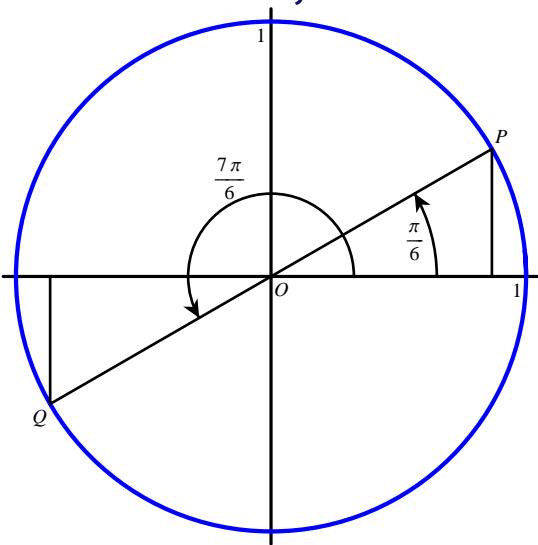
5. Create a table in Excel, select the table and press this button.

6. Copy-paste to WinEdt

## Supported file formats:

PDF	JPG	GIF	PNG
yes	yes	no	yes

Please note: only PDF is scalable. Only use JPG/PNG for photographs!



## Inserting pictures

- In the preamble:

```
\usepackage{graphicx}
```

- At the position of the figure:

```
\includegraphics[width=7cm]{filename}
```

## Inserting pictures

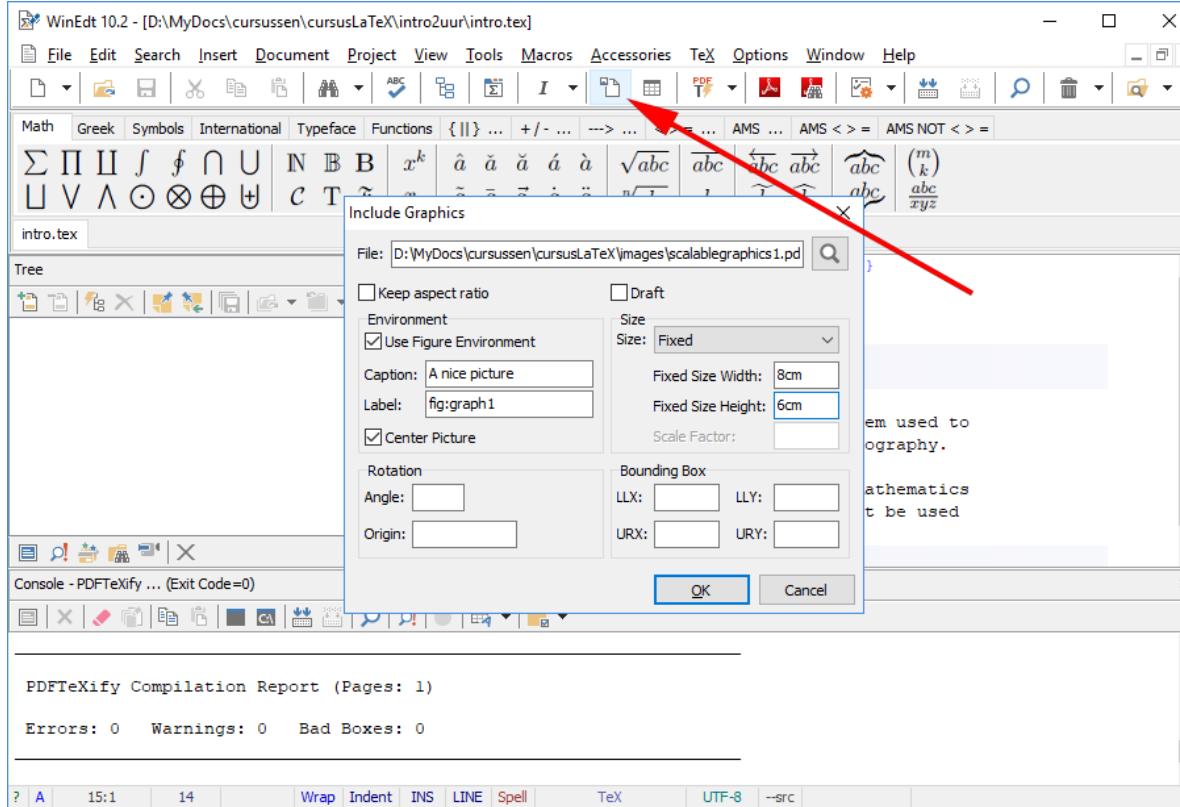
You can create a figure environment to create “floating” figures.  $\text{\LaTeX}$  will put the image at the location that you specify, or on the top of the next page if the figure does not fit at the current page. In a figure environment you can add a caption and a label to refer to the figure.

```
\begin{figure}[ht]
\begin{center}
\includegraphics[width=10cm]{snowwhite.jpg}
\end{center}
\caption{Snowwhite and an apple.}
\label{fig:snowwhite}
\end{figure}
```

Now we can refer to the image:

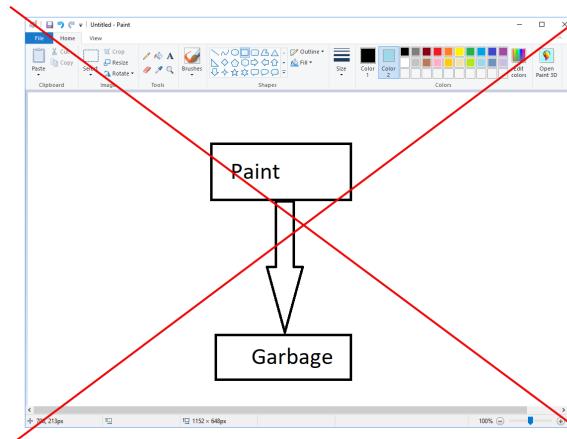
```
See Figure \ref{fig:snowwhite}.
```

## WinEdt plug-in:

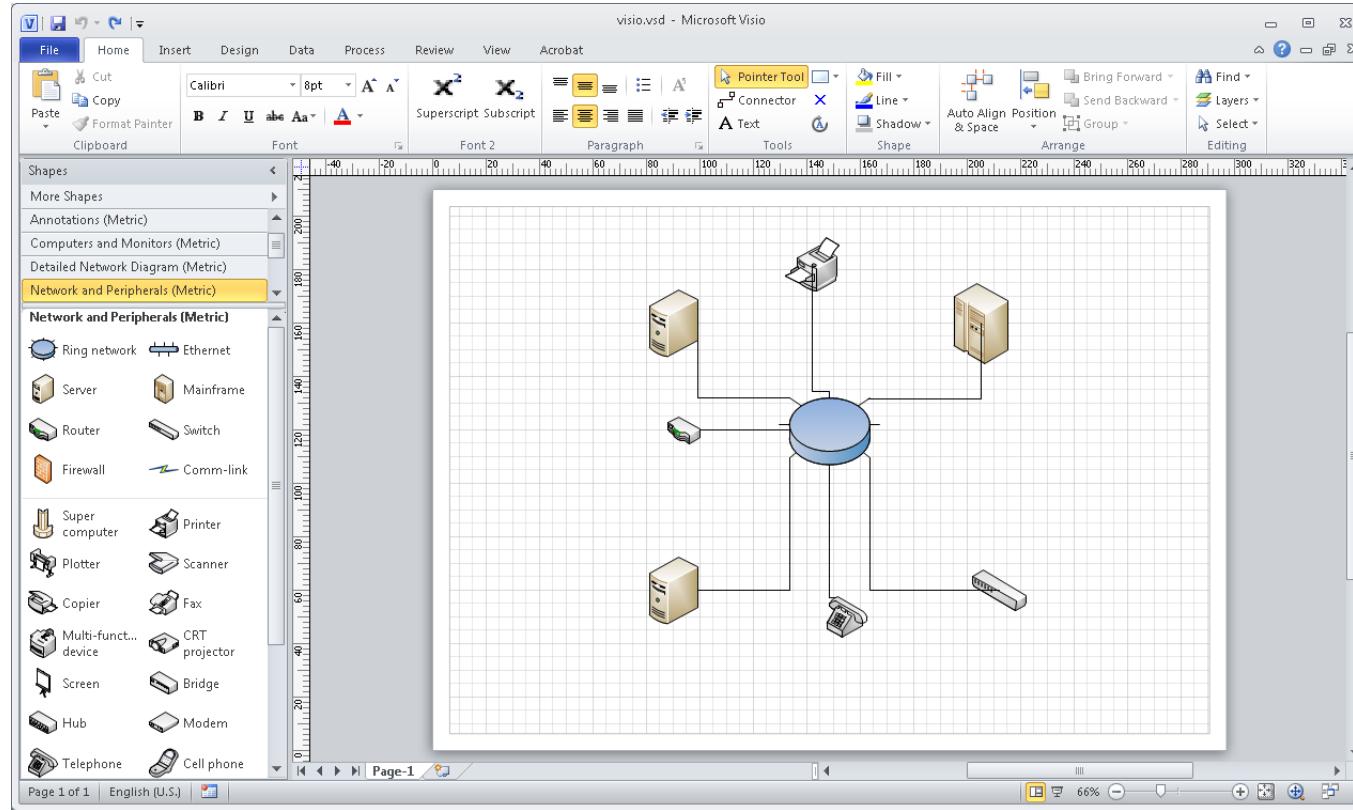


## How to create a picture

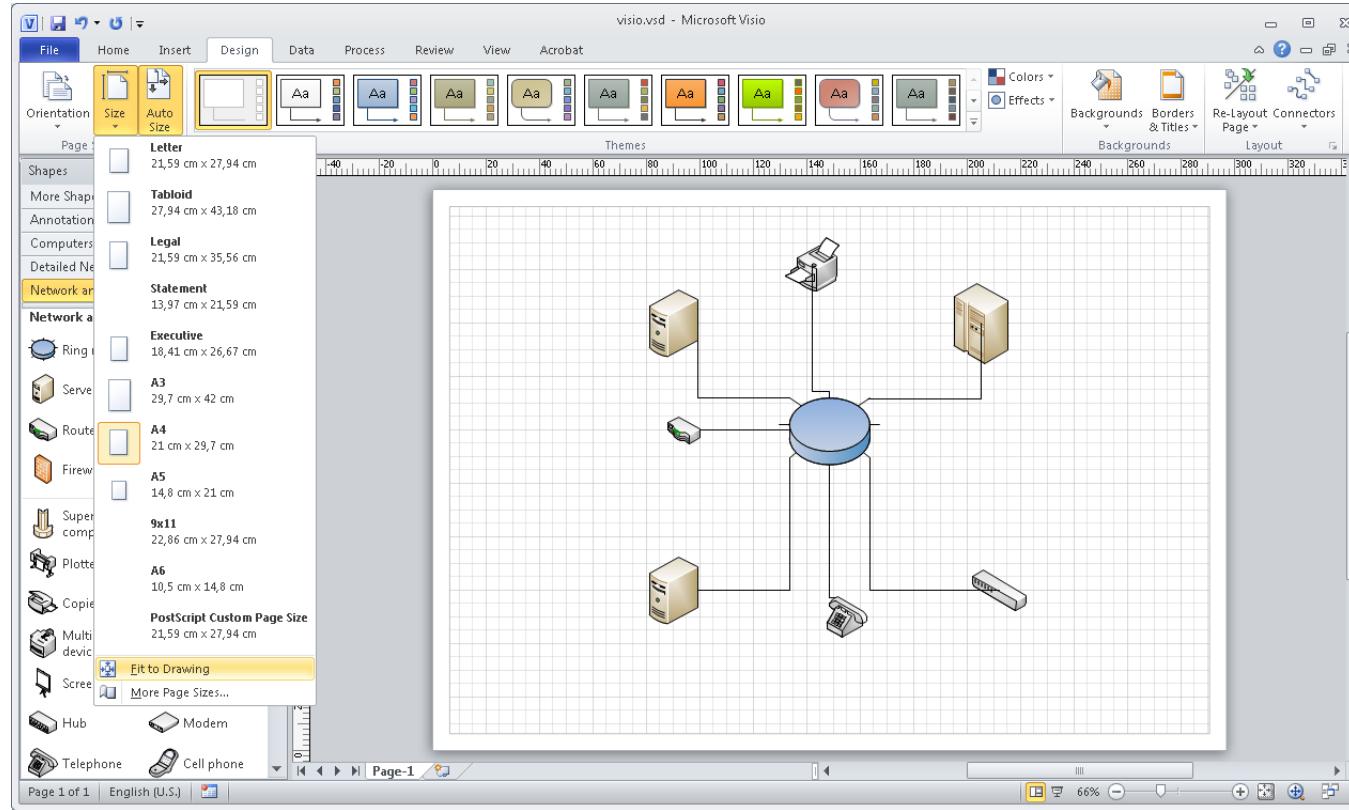
- draw the picture in a program that you commonly use (e.g. Microsoft Visio, Word, Powerpoint, or Adobe Illustrator)
- export the picture to PDF
- sometimes you might need to crop the image. Adobe Acrobat Professional can do this (available from TU/e software page).
- do not use Paint, because it will not create scalable images. Powerpoint or Word are better.



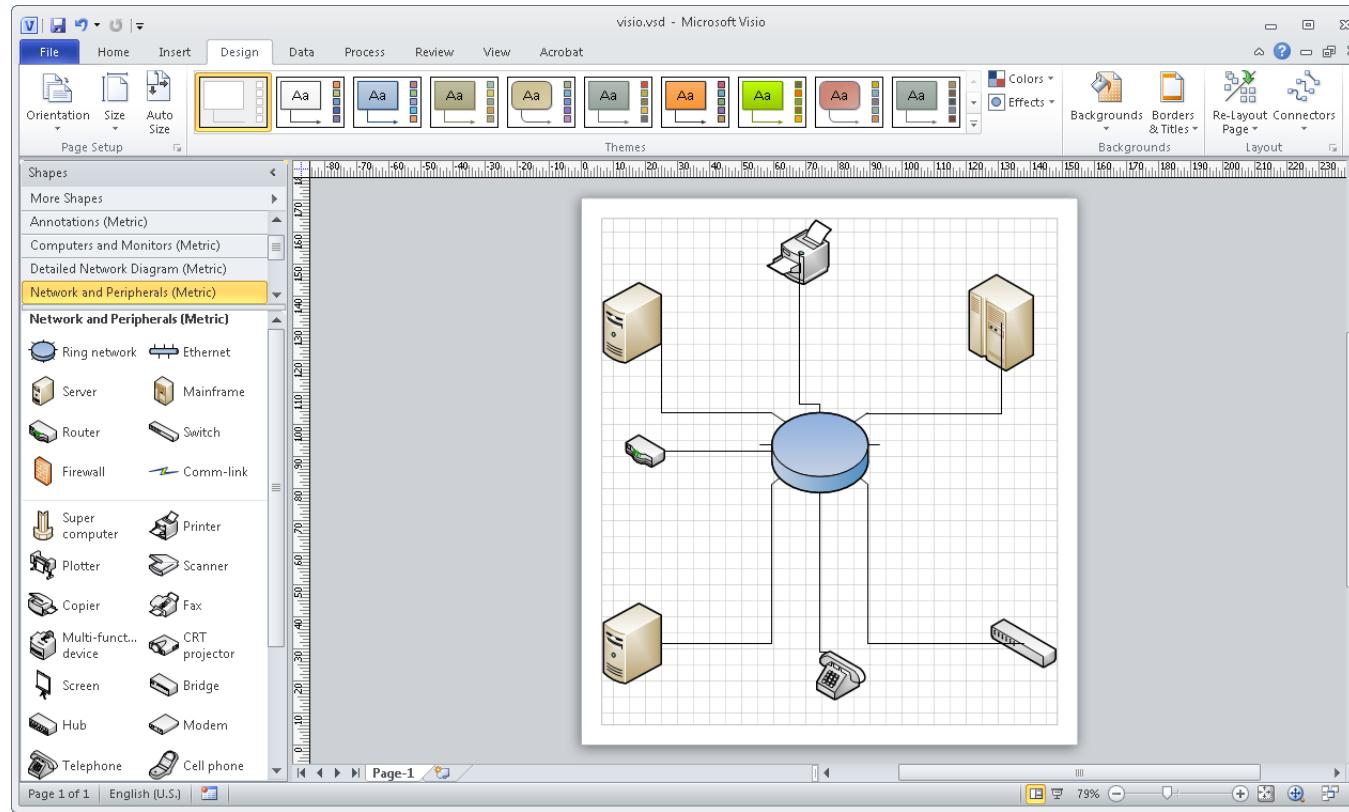
## MS Visio + Adobe Acrobat Pro



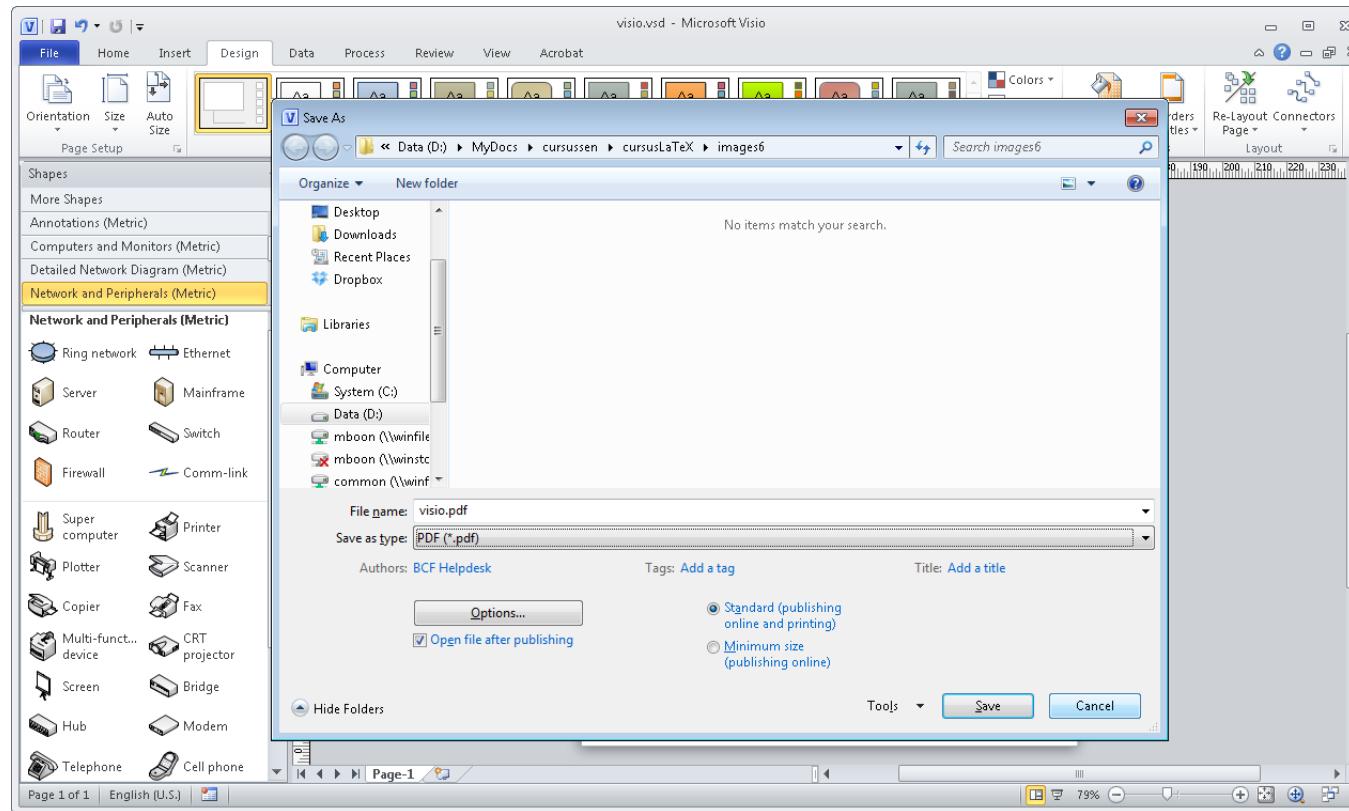
## MS Visio + Adobe Acrobat Pro



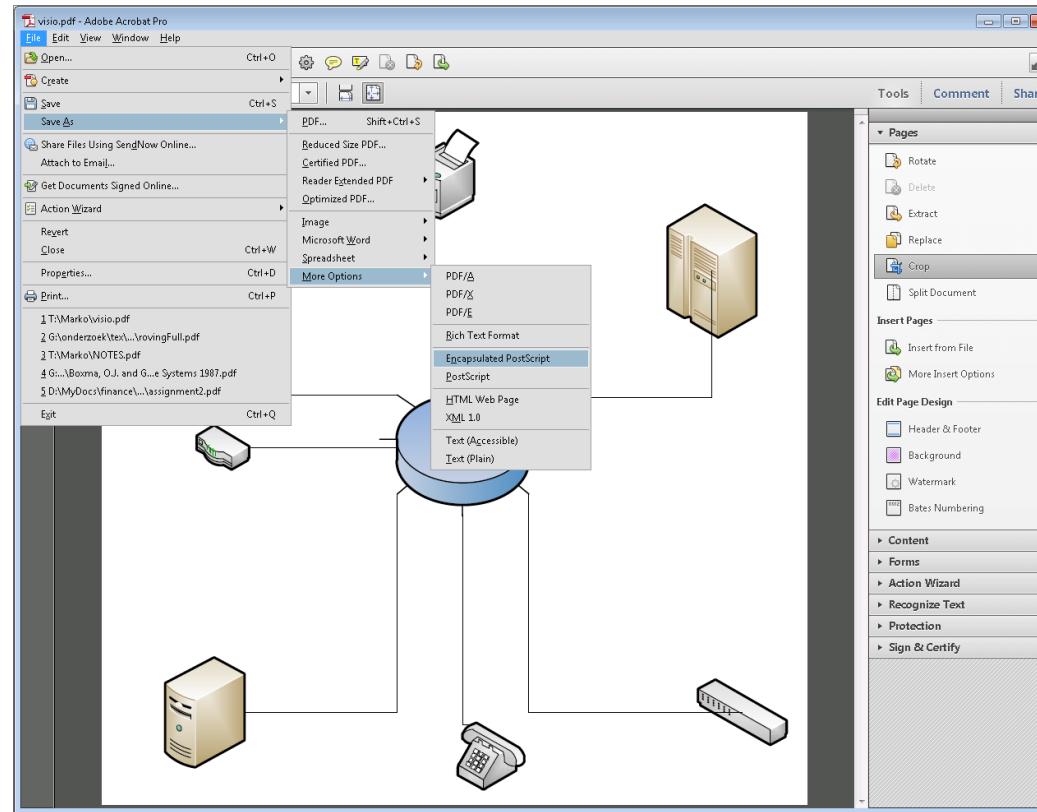
## MS Visio + Adobe Acrobat Pro



## MS Visio + Adobe Acrobat Pro



## MS Visio + Adobe Acrobat Pro



## I want to know more about $\text{\LaTeX}$ !!!

- The LaTeX manual, written by Piet van Oostrum. This is available at the sales point of TU/e syllabi. PDF version already on your laptop!
- Other documentation, in your MiK $\text{\TeX}$  start menu group, in the Documentation folder.
- These slides: <http://www.win.tue.nl/~marko/latex/intro/>
- Online tutorials (for example ShareLaTeX documentation)
- Google
- Train (GEWIS initiative)

# LaTeX

Training  
where  $t_{s,h,d,y}$  is the observed stream water temperature measurement at the site ( $s$ ) and basin ( $h$ ) identified by the 8-digit Hydrologic Unit Code (HUC) ( $d$ ) in each year ( $y$ ). We describe the normal distribution with the standard deviation ( $\sigma$ ) and expected temperature ( $\mu$ ) which has a linear trend.

Learn to process text like a true academic

but the expected temperature ( $\mu_{s,h,d,y}$ ) is adjusted based on the residual error from the previous day

```
\begin{array}{l}
\mu_{s,h,d,y} = \left( \omega_{s,h,d,y} + \delta_s(t_{s,h,d-1,y}) \right. \\
\quad \left. + \Delta_{s,h,d,y} \right) \text{ if } t_{s,h,d-1,y} \text{ is real} \\
\quad \left. + \omega_{s,h,d,y} \right) \text{ if } t_{s,h,d-1,y} \text{ is not real} \\
\end{array}
```

where  $\Delta_{s,h,d,y}$  is an autoregressive [AR(1)] coefficient that accounts for temporal autocorrelation randomly by site and  $\omega_{s,h,d,y}$  is the residual error from the previous day accounting for temporal autocorrelation in the expected temperature.

$X_d$  is the  $n \times K_0$  matrix of predictor values.

$$t_{s,h,d,y} \sim \mathcal{N}(\mu_{s,h,d,y}, \sigma)$$

where  $t_{s,h,d,y}$  is the observed stream water temperature at the site ( $s$ ) and basin ( $h$ ) identified by the 8-digit Hydrologic Unit Code (HUC) ( $d$ ) in each year ( $y$ ). We describe the normal distribution with the standard deviation ( $\sigma$ ) and expected temperature ( $\mu$ ) which has a linear trend.

$$\mu_{s,h,d,y} = X^0 B^0 + X_h^{huc} B_h^{huc} + X_{s,h}^{site} B_{s,h}^{site} + \Delta_{s,h,d,y}$$

but the expected temperature ( $\mu_{s,h,d,y}$ ) is adjusted based on the residual error from the previous day

$$\mu_{s,h,d,y} = \begin{cases} \omega_{s,h,d,y} + \delta_s(t_{s,h,d-1,y} - \omega_{s,h,d-1,y}) \\ \omega_{s,h,d,y} \end{cases} \text{ for } t_{s,h,d-1,y} \text{ is real} \\ \text{for } t_{s,h,d-1,y} \text{ is not real}$$

Beginners course:

9th of October  
18:30 - 21:00

Advanced course:  
16th of October  
18:30 - 21:00



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We used 10 fixed effect parameters in the model. These include latitude, longitude, upstream drainage area, percent forest cover, elevation, surficial coarseness classification, percent wetland area, upstream impounded area, and an