

GSNS L^AT_EX course

T_EXniCie

8 September 2022

Slides are available at
a-eskwadraat.nl/latex

Schedule

- ▶ Introduction
- ▶ Text formatting
- ▶ Structure of a document
- ▶ ⟨Exercises!⟩
- ▶ Images
- ▶ Formulas
- ▶ ⟨Exercises!⟩
- ▶ Closing remarks

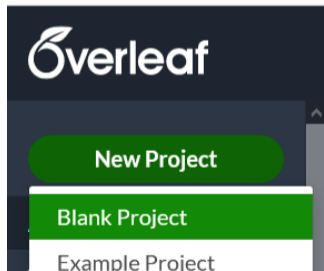
Overleaf

LaTeX is the programming language.

Overleaf is a website where you can write and compile LaTeX.

Visual Studio Code is a desktop app where you can write and compile LaTeX.

MiKTeX does compilation for Visual Studio code.



For now: Overleaf.

Want VS Code? Instructions at
vkuhlmann.com/latex/installation

Simple document

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

\title{My document}
\author{Vincent Kuhlmann}
\date{1 May 2021}

\begin{document}
\maketitle
\section{Introduction}

Hello everyone!
\end{document}
```

My document

Vincent Kuhlmann

7 September 2021

1 Introduction

Hello everyone!

```
Lorem ipsum \tiny dolor sit amet, consectetur adipiscing  
elit. Phasellus elementum, lacus quis tempus  
scelerisque, elit diam vulputate ex, semper elementum  
massa odio in ante.
```

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Phasellus elementum, lacus quis tempus scelerisque, elit diam vulputate ex, semper
elementum massa odio in ante.

```
Lorem {ipsum \tiny dolor sit ame}t, consectetur  
adipiscing elit. Phasellus {elementum}, lacus quis  
tempus scelerisque, {elit diam vulputate ex, semper}  
elementum massa odio in ante.
```

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Phasellus elementum, lacus quis tempus scelerisque, elit diam vulputate ex, semper elementum massa odio in ante.

Paragraphs

```
Lorem ipsum dolor sit amet,  
... ornare sit amet.  
In ipsum ante, sollicitudin  
... sit amet augue.
```

```
Lorem ipsum dolor sit amet,  
... ornare sit amet.  
  
In ipsum ante, sollicitudin  
... sit amet augue.
```

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Integer id erat leo. Suspendisse sit amet ligula turpis. Duis congue turpis odio, non ornare elit ornare sit amet. In ipsum ante, sollicitudin at euismod vitae, tincidunt vitae massa. Aenean metus lectus, porta at tempor at, dapibus sit amet augue.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Integer id erat leo. Suspendisse sit amet ligula turpis. Duis congue turpis odio, non ornare elit ornare sit amet.

In ipsum ante, sollicitudin at euismod vitae, tincidunt vitae massa. Aenean metus lectus, porta at tempor at, dapibus sit amet augue.

Paragraphs

```
...  
\usepackage{parskip}  
\begin{document}  
Lorem ipsum dolor sit amet,  
... ornare sit amet.  
  
In ipsum ante, sollicitudin  
... sit amet augue.  
\end{document}
```

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Integer id erat leo. Suspendisse sit amet ligula turpis. Duis congue turpis odio, non ornare elit ornare sit amet.

In ipsum ante, sollicitudin at euismod vitae, tincidunt vitae massa. Aenean metus lectus, porta at tempor at, dapibus sit amet augue.

Lists

```
These are the ingredients:
```

```
\begin{itemize}
  \item Carrots
  \begin{enumerate}
    \item Buy
    \item Peel
    \item Chop
  \end{enumerate}
  \item Onions

  Lipsum dolor sit amet.
  \item Potatoes
\end{itemize}
```

These are the ingredients:

- Carrots
 1. Buy
 2. Peel
 3. Chop
- Onions

Lipsum dolor sit amet.
- Potatoes

Special characters

Code	Result	Code	Result
<code>\{</code>	{	<code>{</code>	Begin group
<code>\}</code>	}	<code>}</code>	End group
<code>\%</code>	%	<code>%</code>	Comment
<code>_</code>	—	<code>_</code>	Used in maths
<code>\textasciicircum</code>	^	<code>^</code>	Used in maths
<code>\\$</code>	\$	<code>\$</code>	Math mode
<code>\textbackslash</code>	\	<code>\</code>	Command
<code>\&</code>	&	<code>&</code>	Column separation
<code>\#</code>	#	<code>#</code>	Parameter
<code>\textgreater</code>	>	<code>></code>	>
<code>\textless</code>	<	<code><</code>	<

Comments

```
% TODO Translate to English
\section{Nonsense}

%Lorem ipsum dolor sit amet,
%\textfb{ornare} sit amet.
%
%\subsection{About  $\sqrt{2}$ }
```

1 Nonsense

Quotes

'LaTeX' : 'LaTeX'

`LaTeX' : 'LaTeX'

` `LaTeX' ' : "LaTeX"

Simple document

```
\documentclass{article}

\usepackage[utf8]{inputenc}

\title{My document}
\author{Vincent Kuhlmann}
\date{1 May 2021}
```

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

Hello everyone!
\end{document}
```

Preamble

My document

Vincent Kuhlmann

1 May 2021

1 Introduction

Hallo iedereen!

Document

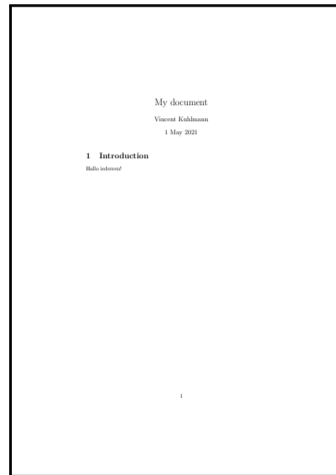
Page margins

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

\title{My document}
\author{Vincent Kuhlmann}
\date{1 May 2021}

\begin{document}
  \maketitle
  \section{Introduction}

  Hello everyone!
\end{document}
```



Page margins

```
\documentclass[a4paper]{article}
\usepackage[utf8]{inputenc}
\usepackage[margin=2.54cm]{geometry}

\title{My document}
\author{Vincent Kuhlmann}
\date{1 May 2021}

\begin{document}
  \maketitle
  \section{Introduction}

  Hello everyone!
\end{document}
```



Page margins

```
\documentclass[a4paper]{article}
\usepackage[utf8]{inputenc}
\usepackage[margin=2.54cm, left=-0.5cm]
{geometry}

\title{My document}
\author{Vincent Kuhlmann}
\date{1 May 2021}

\begin{document}
  \maketitle
  \section{Introduction}

  Hello everyone!
\end{document}
```



Contents

```
\begin{document}
  \maketitle
  \tableofcontents

  \section{AA}
  ...
\end{document}
```

Contents

1	AA	1
2	BB	2
2.1	CC	2
2.1.1	DD	2
2.2	EE	2
3	FF	2
3.0.1	GG	2

1 AA

Lorem ipsum dolor sit amet, consectetur adipiscing elit.

Contents

```
\begin{document}
  \maketitle
  \tableofcontents
  \newpage

  \section{AA}
  ...
\end{document}
```

Contents

1	AA	2
2	BB	2
2.1	CC	2
2.1.1	DD	2
2.2	EE	2
3	FF	2
3.0.1	GG	2

Contents

```
...  
\usepackage[dutch]{babel}  
  
\begin{document}  
  \maketitle  
  \tableofcontents  
  \newpage  
  
  \section{AA}  
  ...  
\end{document}
```

Inhoudsopgave

1	AA	2
2	BB	2
2.1	CC	2
2.1.1	DD	2
2.2	EE	2
3	FF	2
3.0.1	GG	2

Partial numbering

```
\setcounter{secnumdepth}{3}
\section{AA}
Lorem ipsum dolor sit amet,
consectetur adipiscing elit.

\section{BB}
\subsection{CC}
\subsubsection{DD}
\subsection{EE}
Nullam a risus at arcu
lobortis viverra vel
volutpat diam.

\section{FF}
\subsubsection{GG}
```

1 AA

Lorem ipsum dolor sit amet, consectetur adipiscing elit.

2 BB

2.1 CC

2.1.1 DD

2.2 EE

Nullam a risus at arcu lobortis viverra vel volutpat diam.

3 FF

3.0.1 GG

Partial numbering

```
\setcounter{secnumdepth}{2}
\section{AA}
Lorem ipsum dolor sit amet,
consectetur adipiscing elit.

\section{BB}
\subsection{CC}
\subsubsection{DD}
\subsection{EE}
Nullam a risus at arcu
lobortis viverra vel
volutpat diam.

\section{FF}
\subsubsection{GG}
```

1 AA

Lorem ipsum dolor sit amet, consectetur adipiscing elit.

2 BB

2.1 CC

DD

2.2 EE

Nullam a risus at arcu lobortis viverra vel volutpat diam.

3 FF

GG

Partial numbering

```
\setcounter{secnumdepth}{1}
\section{AA}
Lorem ipsum dolor sit amet,
consectetur adipiscing elit.

\section{BB}
\subsection{CC}
\subsubsection{DD}
\subsection{EE}
Nullam a risus at arcu
lobortis viverra vel
volutpat diam.

\section{FF}
\subsubsection{GG}
```

1 AA

Lorem ipsum dolor sit amet, consectetur adipiscing elit.

2 BB

CC

DD

EE

Nullam a risus at arcu lobortis viverra vel volutpat diam.

3 FF

GG

Partial numbering

```
\setcounter{secnumdepth}{0}
\section{AA}
Lorem ipsum dolor sit amet,
consectetur adipiscing elit.

\section{BB}
\subsection{CC}
\subsubsection{DD}
\subsection{EE}
Nullam a risus at arcu
lobortis viverra vel
volutpat diam.

\section{FF}
\subsubsection{GG}
```

AA

Lorem ipsum dolor sit amet, consectetur adipiscing elit.

BB

CC

DD

EE

Nullam a risus at arcu lobortis viverra vel volutpat diam.

FF

GG

Partial numbering

```
\section{AA}
Lorem ipsum dolor sit amet,
consectetur adipiscing elit.
```

```
\section*{BB}
\subsection*{CC}
\subsubsection{DD}
\subsection*{EE}
Nullam a risus at arcu
lobortis viverra vel
volutpat diam.
```

```
\section{FF}
\subsubsection{GG}
```

1 AA

Lorem ipsum dolor sit amet, consectetur adipiscing elit.

BB

CC

1.0.1 DD

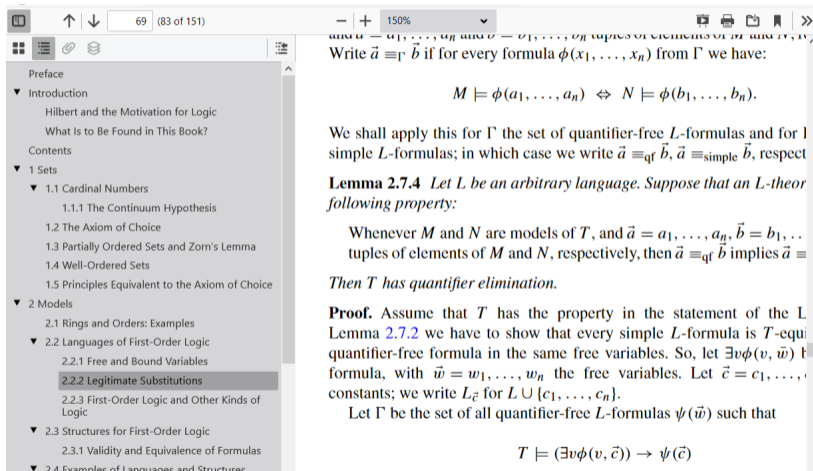
EE

Nullam a risus at arcu lobortis viverra vel volutpat diam.

2 FF

2.0.1 GG

Vincent's favorite package: `\usepackage [bookmarksnumbered] {hyperref}`



The screenshot shows a PDF viewer window. On the left is a table of contents with the following structure:

- Preface
- Introduction
 - Hilbert and the Motivation for Logic
 - What Is to Be Found in This Book?
- Contents
- 1 Sets
 - 1.1 Cardinal Numbers
 - 1.1.1 The Continuum Hypothesis
 - 1.2 The Axiom of Choice
 - 1.3 Partially Ordered Sets and Zorn's Lemma
 - 1.4 Well-Ordered Sets
 - 1.5 Principles Equivalent to the Axiom of Choice
- 2 Models
 - 2.1 Rings and Orders: Examples
 - 2.2 Languages of First-Order Logic
 - 2.2.1 Free and Bound Variables
 - 2.2.2 Legitimate Substitutions
 - 2.2.3 First-Order Logic and Other Kinds of Logic
 - 2.3 Structures for First-Order Logic
 - 2.3.1 Validity and Equivalence of Formulas
 - 2.4 Examples of Languages and Structures

The main content area shows a page with the following text:

and $\vec{a} = a_1, \dots, a_n$ and $\vec{b} = b_1, \dots, b_n$ tuples of elements of M and N , respectively. Write $\vec{a} \equiv_{\Gamma} \vec{b}$ if for every formula $\phi(x_1, \dots, x_n)$ from Γ we have:

$$M \models \phi(a_1, \dots, a_n) \Leftrightarrow N \models \phi(b_1, \dots, b_n).$$

We shall apply this for Γ the set of quantifier-free L -formulas and for L simple L -formulas; in which case we write $\vec{a} \equiv_{\text{qf}} \vec{b}$, $\vec{a} \equiv_{\text{simple}} \vec{b}$, respect

Lemma 2.7.4 *Let L be an arbitrary language. Suppose that an L -theory T has the following property:*

Whenever M and N are models of T , and $\vec{a} = a_1, \dots, a_n$, $\vec{b} = b_1, \dots, b_n$ tuples of elements of M and N , respectively, then $\vec{a} \equiv_{\text{qf}} \vec{b}$ implies $\vec{a} \equiv_T \vec{b}$.

Then T has quantifier elimination.

Proof. Assume that T has the property in the statement of the Lemma. By Lemma 2.7.2 we have to show that every simple L -formula is T -equivalent to a quantifier-free formula in the same free variables. So, let $\exists v\phi(v, \vec{w})$ be a simple formula, with $\vec{w} = w_1, \dots, w_n$ the free variables. Let $\vec{c} = c_1, \dots, c_n$ be constants; we write $L_{\vec{c}}$ for $L \cup \{c_1, \dots, c_n\}$.

Let Γ be the set of all quantifier-free L -formulas $\psi(\vec{w})$ such that

$$T \models (\exists v\phi(v, \vec{c})) \rightarrow \psi(\vec{c})$$

A lot of packages

Necessary for examples in this presentation.

Improve page margins, mathematics, paragraph indent, language, images and more.

Find a template including the most important packages from Vincent's website, on

vkuhlmann.com/latex/example

`\includegraphics`

Here you see a penguin:

```
\includegraphics [height=2cm] {penguin.jpg}
```

Photo by Sue Flood.

`\includegraphics`

Here you see a penguin:

```
\includegraphics [height=2cm] {penguin.jpg}
```

Photo by Sue Flood.



Here you see a penguin: Photo by Sue Flood.

<https://www.pinterest.co.kr/pin/645844402812554993/>

`\includegraphics`

```
Here you see a penguin:
```

```
\includegraphics [height=2cm] {penguin.jpg}
```

```
Photo by Sue Flood.
```

Here you see a penguin:



Photo by Sue Flood.

`\includegraphics`

Here you see a penguin:

```
\begin{center}
  \includegraphics [height=2cm] {penguin.jpg}
\end{center}
Photo by Sue Flood.
```

Here you see a penguin:



Photo by Sue Flood.

`\includegraphics`

You can see a penguin in Figure~`\ref{fig:penguin}`.

```
\begin{figure}[h]
  \centering
  \includegraphics[height=2cm]{penguin.jpg}
  \caption{A cute penguin. Photo by Sue Flood.}
  \label{fig:penguin}
\end{figure}
```

You can see a penguin in Figure 1.



Figure 1: A cute penguin. Photo by Sue Flood.

Figure placement

```
\begin{figure}[h]
```

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.. Zie hier voor Figuur 1.



Figure 1: Voorbeeld van figuurplaatsing.

Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultrices et, tellus. Do-

1

nec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

2

Figure placement

```
\begin{figure}[t]
```



Figure 2: Voorbeeld van figuurplaatsing.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Zie hiervoor Figuur 2.

Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultrices et, tellus. Do-

3

nec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

4

Figure placement

```
\begin{figure}[b]
```

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Zie hiervoor Figuur 3.

Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultrices et, tellus. Do-



Figure 3: Voorbeeld van figuurplaatsing.

5

nec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

6

Figure placement

```
\begin{figure}[p]
```

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Zie hiervoor Figuur 4.

Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultrices et, tellus. Donec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

7



Figure 4: Voorbeeld van figuurplaatsing.

8

Figure placement

- ▶ h (HERE): Figure can come here.
- ▶ t (TOP): Figure can come at the top of the page.
- ▶ b (BOTTOM): Figure can come at the bottom of the page
- ▶ p (PAGE): Figure can come on a special page for figures.
- ▶ !: Override internal parameters for floats.
- ▶ H (HERE): No floating, always here. (`\usepackage{float}`)

When working with images: `\usepackage{graphicx}`

Dimensions

- Full linewidth

```
\includegraphics[width=\linewidth]{assets/penguin.jpg}
```

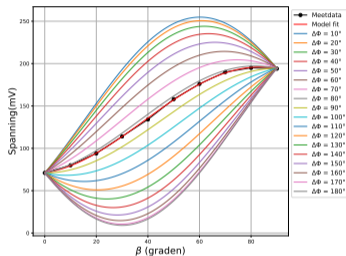
- 90% linewidth

```
\includegraphics[width=0.9\linewidth]{assets/penguin.jpg}
```

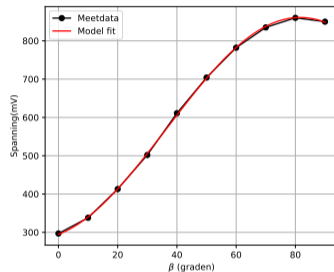
- Width maximally 90% linewidth and height maximally 5 cm

```
\includegraphics [  
    width=0.9\linewidth , height=5cm , keepaspectratio  
]{assets/penguin.jpg}
```

Subfigure `\usepackage{subcaption}`



(a) BB



(b) CC

Figuur 1: Multiple images next to eachother!

Subfigure (`\usepackage{subcaption}`)

```
\begin{figure}[htbp]
  \centering
  \begin{subfigure}[b]{0.45\textwidth}
    \includegraphics[width=\textwidth]{AA}
    \caption{BB}
    \label{fig:dphiExample}
  \end{subfigure}\quad
  \begin{subfigure}[b]{0.45\textwidth}
    \includegraphics[width=\textwidth]{CC}
    \caption{CC}
    \label{fig:fitExample}
  \end{subfigure}
  \caption{Multiple images next to eachother!}
\end{figure}
```

Formulas: The basics

Formula	Code	Formula	Code
$\sqrt{2}$	<code>\$ \sqrt{2} \$</code>	$\sqrt[3]{8}$	<code>\$ \sqrt[3]{8} \$</code>
$\frac{2}{3}$	<code>\$ \frac{2}{3} \$</code>	x_1	<code>\$ x_1 \$</code>
$6 \geq 3$	<code>\$ 6 \geq 3 \$</code>	x_1^2	<code>\$ x_1^2 \$</code>
$a^2 + b^2$	<code>\$ a^2 + b^2 \$</code>	a^{2+b^2}	<code>\$ a^{2 + b^2} \$</code>

`$ x^22 $`: x^{22} | `$ x^{22} $`: x^{22}

Formulas: Symbols

Formula	Code	Formula	Code
x_1, \dots, x_n	<code>\$ x_1, \dots, x_n \$</code>	$5 \cdot 6$	<code>\$ 5\cdot 6 \$</code>
α, β, γ	<code>\$ \alpha, \beta, \gamma \$</code>	A, B, Γ	<code>\$ A, B, \Gamma \$</code>
ϵ, ε	<code>\$ \epsilon, \varepsilon \$</code>	\mathcal{P}	<code>\$ \mathcal{P} \$</code>
ϕ, φ	<code>\$ \phi, \varphi \$</code>	\mathbb{P}	<code>\$ \mathbb{P} \$</code>

Formulas: Vectors

Formula	Code	Formula	Code
\vec{x}	<code>$\backslash\text{vec}\{x\}$</code>	\vec{F}_{tot}	<code>$\backslash\text{vec}\{F\}_{\backslash\text{text}\{tot\}}$</code>
\mathbf{x}	<code>$\backslash\text{mathbf}\{x\}$</code>	$\hat{i} + 6\hat{k}$	<code>$\backslash\text{hat}\{\imath\} + 6\backslash\text{hat}\{k\}$</code>
$\ \vec{x}\ $	<code>$\backslash\text{norm}\{\backslash\text{vec}\{x\}\}$</code>	$\nabla \times \mathbf{A}$	<code>$\backslash\text{nabla}\backslash\text{times}\backslash\text{mathbf}\{A\}$</code>

$$\vec{F}_{tot}, \vec{F}_{tot}$$

sin(x)

\vec{F}_{tot}

```
$ sin(x) $  
$ \vec{F}_{tot}$
```

sin(x)

\vec{F}_{tot}

```
$ \sin(x) $  
$ \vec{F}_{\text{tot}}$
```

Formulas: Calculus

```
\usepackage{commath}
```

```
\dod{\sin(x)}{x}, \dod{f(x,y)}{x}, \partial_x f
```

```
\int_{0}^{\infty} e^{-x} \dif x = 1
```

$$\frac{d \sin(x)}{dx}, \frac{\partial f(x,y)}{\partial x}, \partial_x f$$

$$\int_0^{\infty} e^{-x} dx = 1$$

Formulas: Mathematical relations

Formula	Code	Formula	Code
$a \leq b$	<code>\$ a \leq b \$</code>	$a \geq b$	<code>\$ a \geq b \$</code>
$a < b$	<code>\$ a < b \$</code>	$a > b$	<code>\$ a > b \$</code>
$a \ll b$	<code>\$ a \ll b \$</code>	$a \gg b$	<code>\$ a \gg b \$</code>
$a = b$	<code>\$ a = b \$</code>	$a \simeq b$	<code>\$ a \simeq b \$</code>
$a \neq b$	<code>\$ a \neq b \$</code>	$a \approx b$	<code>\$ a \approx b \$</code>
$a \sim b$	<code>\$ a \sim b \$</code>	$a \stackrel{*}{=} b$	<code>\$ a \stackrel{*}{=} b \$</code>

Formulas: Arrows and operators

```
\DeclareMathOperator{\Image}{Image}
```

```
a \iff b, a\implies b, a\mapsto b  
\lim_{x\to 0}\frac{\sin(x)}{x} = 1  
\Image(f) = \mathbb{R}_{\geq 0}
```

$$a \iff b, a \implies b, a \mapsto b$$

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

$$\text{Image}(f) = \mathbb{R}_{\geq 0}$$

So many! And there are lots more :-)

CTAN symbol list:

<http://mirrors.ctan.org/info/symbols/comprehensive/symbols-a4.pdf>

Detexify:

<http://detexify.kirelabs.org/classify.html>

SNIPPET VIEW

Symbols TikZ

Search

Operators and Relations ▾

- All
- Greek/Hebrew Letters
- Delimiters
- Maths Constructs
- Variable-sized symbols
- Standard Functions
- Operators and Relations**
- Arrows
- Accents
- Miscellaneous
- Letter Styles

The image shows a dark-themed LaTeX symbol palette. At the top, it says 'SNIPPET VIEW' with a dropdown arrow, followed by 'Symbols' and 'TikZ'. Below this is a search bar. The main area is filled with rows of various mathematical symbols. A dropdown menu is open over the symbols, listing categories: 'Operators and Relations' (highlighted in blue), 'All', 'Greek/Hebrew Letters', 'Delimiters', 'Maths Constructs', 'Variable-sized symbols', 'Standard Functions', 'Arrows', 'Accents', 'Miscellaneous', and 'Letter Styles'. The symbols in the background include asterisks, dots, circles, diamonds, crosses, division signs, Greek letters like alpha, and various mathematical operators and symbols.

Equation

The trigonometric identity is

```
$ \sin^2(\theta) + \cos^2(\theta) = 1 $.
```

The trigonometric identity is

```
\begin{equation}
  \sin^2(\theta) + \cos^2(\theta) = 1.
\end{equation}
```

The trigonometric identity is $\sin^2(\theta) + \cos^2(\theta) = 1$.

The trigonometric identity is

$$\sin^2(\theta) + \cos^2(\theta) = 1. \tag{1}$$

Align

The double-angle formula can now be rewritten as

```
\begin{align}
\cos(2\theta) &= \cos^2(\theta) - \sin^2(\theta) \\
&= 2\cos^2(\theta) - 1.
\end{align}
```

The double-angle formula can now be rewritten as

$$\cos(2\theta) = \cos^2(\theta) - \sin^2(\theta) \tag{1}$$

$$= 2\cos^2(\theta) - 1. \tag{2}$$

Align

The double-angle formula can now be rewritten as

```
\begin{align}
\cos(2\theta) &= \cos^2(\theta) - \sin^2(\theta) \\
&= 2\cos^2(\theta) - 1.
\end{align}
```

The double-angle formula can now be rewritten as

$$\cos(2\theta) = \cos^2(\theta) - \sin^2(\theta) \quad (1)$$

$$= 2\cos^2(\theta) - 1. \quad (2)$$

Align

The double-angle formula can now be rewritten as

```
\begin{align}
\cos(2\theta) &= \cos^2(\theta) - \sin^2(\theta)
\nonumber \\
&= 2\cos^2(\theta) - 1.
\end{align}
```

The double-angle formula can now be rewritten as

$$\begin{aligned}\cos(2\theta) &= \cos^2(\theta) - \sin^2(\theta) \\ &= 2\cos^2(\theta) - 1.\end{aligned}\tag{1}$$

Align

The double-angle formula can now be rewritten as

```
\begin{align*}
\cos(2\theta) &= \cos^2(\theta) - \sin^2(\theta) \\
&= 2\cos^2(\theta) - 1.
\end{align*}
```

The double-angle formula can now be rewritten as

$$\begin{aligned}\cos(2\theta) &= \cos^2(\theta) - \sin^2(\theta) \\ &= 2\cos^2(\theta) - 1.\end{aligned}$$

Align

We do this with the double-angle formula

```
\begin{align*}
\cos(2\theta) &= \cos^2(\theta) - \sin^2(\theta),
\end{align*}
```

which we can rewrite as

```
\begin{align*}
&= \cos^2(\theta) - (1 - \cos^2(\theta)) \\
&= 2\cos^2(\theta) - 1.
\end{align*}
```

We do this with the double-angle formula

$$\cos(2\theta) = \cos^2(\theta) - \sin^2(\theta),$$

which we can rewrite as

$$\begin{aligned} &= \cos^2(\theta) - (1 - \cos^2(\theta)) \\ &= 2\cos^2(\theta) - 1. \end{aligned}$$

Align

We do this with the double-angle formula

```
\begin{align*}
  \cos(2\theta) &= \cos^2(\theta) - \sin^2(\theta), \\
\intertext{which we can rewrite as}
  &= \cos^2(\theta) - (1 - \cos^2(\theta)) \\
  &= 2\cos^2(\theta) - 1.
\end{align*}
```

We do this with the double-angle formula

$$\cos(2\theta) = \cos^2(\theta) - \sin^2(\theta),$$

which we can rewrite as

$$\begin{aligned} &= \cos^2(\theta) - (1 - \cos^2(\theta)) \\ &= 2\cos^2(\theta) - 1. \end{aligned}$$

Also in use

```
AA \(\sqrt{2}\)  
BB \[\sqrt{3}\]  
CC $$ \sqrt{4} $$
```

AA $\sqrt{2}$ BB

$\sqrt{3}$

CC

$\sqrt{4}$

Left-right

```
\begin{align*}
&f(\sum_{i=1}^n x_i) \\
&f\left(\sum_{i=1}^n x_i\right)
\end{align*}
```

$$f\left(\sum_{i=1}^n x_i\right)$$
$$f\left(\sum_{i=1}^n x_i\right)$$

Delimiter point

```
\begin{align*}
  \left.\left[x^2\right]\right|_{x=0}^{x=2} = 4
\end{align*}
```

$$\left[x^2\right]_{x=0}^{x=2} = 4,$$

```

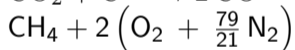
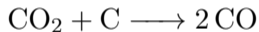
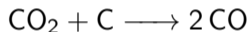
\begin{align*}
R(\theta) &= \begin{pmatrix} \cos(\theta) & -\sin(\theta) \\ \sin(\theta) & \cos(\theta) \end{pmatrix} \\
\abs{x} &= \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}
\end{align*}

```

$$R(\theta) = \begin{pmatrix} \cos(\theta) & -\sin(\theta) \\ \sin(\theta) & \cos(\theta) \end{pmatrix}, \quad |x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

Chemical formulas `\usepackage{mhchem}`

```
\ce{CO2 + C -> 2 CO}\\
$\ce{CO2 + C -> 2 CO}$\\
\ce{CH4 + 2 $\left(\ce{O2 + 79/21 N2}\right)$}
%$\ce{CH4 + 2 \left(\ce{O2 + 79/21 N2}\right)}$ % Error
```



Some examples are taken from the `mhchem` package documentation (see below)

More example can be found in the documentation of `mhchem`, see

<https://ctan.org/pkg/mhchem>

Installation

vkuhlmann.com/latex/installation

The screenshot shows the Visual Studio Code interface with a LaTeX document open. The editor displays the following code:

```
1 \documentclass[a6paper]{article}
2
3 \usepackage[margin=2,5cm]{geometry}
4 \usepackage[dutch]{babel}
5 \usepackage{parskip}
6 \usepackage{amsmath,amssymb}
7 \usepackage{graphicx}
8 \usepackage{hyperref}
9
10 \begin{document}
11 ... \section{Introductie}
12
13 ... Hallo!
14 ... \begin{align*}
15 ... x = \sqrt{2} + 3
16 ... \end{align*}
17 \end{document}
18
```

The preview window shows the rendered PDF output:

1 Introductie

Hallo!

$$x = \sqrt{2} + 3$$

The end

Questions?

Stuck? Mail us at
`texnicie@a-eskwadraat.nl`

Contributors

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