

UAV L^AT_EX-course

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15 March 2022

Schedule

- ▶ Introduction
- ▶ Text formatting
- ▶ Structure of a document
- ▶ 〈Exercises!〉
- ▶ Images
- ▶ Formulas
- ▶ 〈Exercises!〉
- ▶ Good to know

L^AT_EX vs Word

My document

Lorem ipsum

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Aenean commodo ligula eget dolor. Aenean massa. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Donec quam felis, ultricies nec, pellentesque eu, pretium quis, sem. Nulla consequat massa quis enim.

Donec pede justo

Fringilla vel, aliquet nec, vulputate eget, arcu. In enim justo, rhoncus ut, imperdiet a, venenatis vitae, justo.

Nullam dictum felis eu pede mollis pretium. Integer tincidunt.

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$$

Cras dapibus. Vivamus elementum semper nisi. Aenean vulputate eleifend tellus. Aenean leo ligula, porttitor eu, consequat vitae, eleifend ac, enim. Aliquam lorem ante, dapibus in, viverra quis, feugiat a, tellus.



Figure 1: Bengaalse tijger

My document

Vincent Kuhlmann

3 May 2021

1 Lorem ipsum

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Aenean commodo ligula eget dolor. Aenean massa. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Donec quam felis, ultricies nec, pellentesque eu, pretium quis, sem. Nulla consequat massa quis enim.

1.1 Donec pede justo

Fringilla vel, aliquet nec, vulputate eget, arcu. In enim justo, rhoncus ut, imperdiet a, venenatis vitae, justo.

Nullam dictum felis eu pede mollis pretium. Integer tincidunt.

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2} \quad (1)$$

Cras dapibus. Vivamus elementum semper nisi. Aenean vulputate eleifend tellus. Aenean leo ligula, porttitor eu, consequat vitae, eleifend ac, enim. Aliquam lorem ante, dapibus in, viverra quis, feugiat a, tellus.



Figure 1: Bengaalse tijger

LaTeX vs Word

Inner workings: big difference.

Word: Edit visually

LaTeX: Edit code (text)

```

\title{My document}
\author{Vincent Kuhlmann}
\date{3 May 2021}

\begin{document}
\maketitle
\section{Lorem ipsum}
Lorem ipsum dolor sit amet, consectetur

\begin{align}
f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}
\end{align}

```

My document

Vincent Kuhlmann

3 May 2021

1 Lorem ipsum

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Aenean commodo ligula eget dolor. Aenean massa. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Donec quam felis, ultricies nec, pellentesque eu, pretium quis, sem. Nulla consequat massa quis enim.

1.1 Donec pede justo

Fringilla vel, aliquet nec, vulputate eget, arcu. In enim justo, rhoncus ut, imperdiet a, venenatis vitae, justo.

Nullam dictum felis eu pede mollis pretium. Integer tincidunt.

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2} \quad (1)$$

Cras dapibus. Vivamus elementum semper nisi. Aenean vulputate eleifend tellus. Aenean leo ligula, porttitor eu, consequat vitae, eleifend ac, enim. Aliquam lorem ante, dapibus in, viverra quis, fengiat a, tellus.



Figure 1: Bengaalse tijger

Code vs Visual

```
\begin{lemma}  
  Lorem ipsum dolor sit  
  ... eget dolor.  
  
  \begin{proof}  
    Aenean massa. Cum  
    ... quis enim.  
  \end{proof}  
\end{lemma}
```

Lemma 1.9. *Lorem ipsum dolor sit amet, consectetur adipiscing elit. Aenean commodo ligula eget dolor.*

Proof. Aenean massa. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Donec quam felis, ultricies nec, pellentesque eu, pretium quis, sem. Nulla consequat massa quis enim. \square

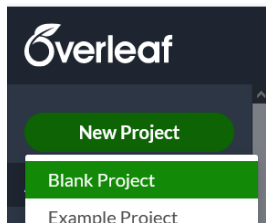
Overleaf

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!

Text effects

Result	Code	Result	Code
Text	<code>\textbf{Text}</code>	Text	<code>\texttt{Text}</code>
<i>Text</i>	<code>\textit{Text}</code>	Text	<code>{\tiny Text}</code>
TEXT	<code>\textsc{Text}</code>	Text	<code>{\LARGE Text}</code>
<u>Text</u>	<code>\underline{Text}</code>	Text	<code>\textcolor{red}{Text}</code> ¹

Huge, huge, LARGE, Large, large, normalsize, small, footnotesize, scriptsize, tiny

¹`\usepackage{xcolor}`


```

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.

Lorem ipsum \textbf dolor sit: Lorem ipsum **dolor** sit
 Lorem ipsum \textbf{dolor} sit: Lorem ipsum **dolor** sit

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:

1. Carrots
2. Onions

Lipsum dolor sit amet.

3. Potatoes

```
These are the ingredients:
```

```
\begin{enumerate}
```

```
  \item Carrots
```

```
  \item Onions
```

```
  Lipsum dolor sit amet.
```

```
  \item Potatoes
```

```
\end{enumerate}
```

Lists

These are the ingredients:

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

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

These are the ingredients:

1. Carrots

(a) Buy

(b) Peel

(c) Chop

2. Onions

Lipsum dolor sit amet.

3. Potatoes

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

Lists

These are the ingredients:

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

Lipsum dolor sit amet.

```
\item Potatoes
\end{itemize}
```

These are the ingredients:

- Carrots
 - Buy
 - Peel
 - Chop
- Onions

Lipsum dolor sit amet.

- Potatoes

Special characters

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

Comments

```
% Make soul package work in beamer presentations
% Source: https://tex.stackexchange.com/...
\let\UL\ul
\makeatletter
\renewcommand\ul{
  \let\set@color\beamerorig@set@color
  \let\reset@color\beamerorig@reset@color
  \UL
}
...
```

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}
```

Preamble

My document

Vincent Kuhlmann

1 May 2021

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

Hello everyone!
\end{document}
```

Document

1 Introduction

Hallo iedereen!

Page margins

```

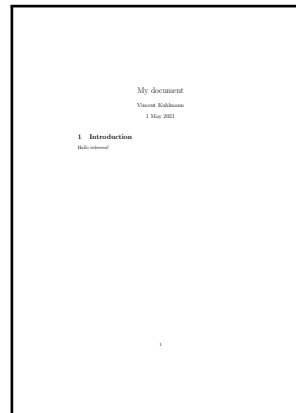
\documentclass{article}
\usepackage[utf8]{inputenc}

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

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

  Hello everyone!
\end{document}

```



Page margins

```

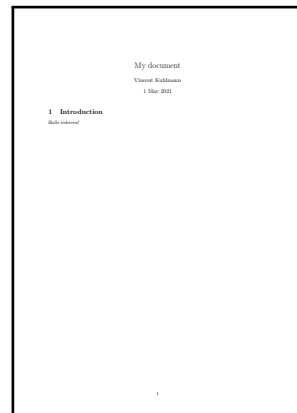
\documentclass[a4paper]{article}
\usepackage[utf8]{inputenc}
\usepackage[margin=2.54cm]{geometry}

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

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

  Hello everyone!
\end{document}

```



Page margins

```

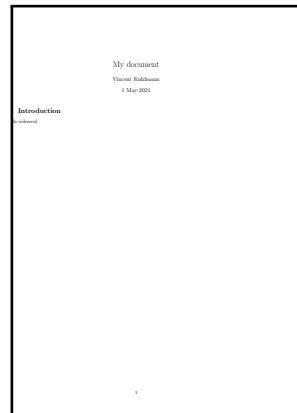
\documentclass[a4paper]{article}
\usepackage[utf8]{inputenc}
\usepackage[margin=2.54cm, left=-0.5cm]
{geometry}

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

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

  Hello everyone!
\end{document}

```



Section commands

```
\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

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

Vincents favorite package: `\usepackage[bookmarksnumbered]{hyperref}`

The screenshot shows a LaTeX Beamer presentation. 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 right side of the screenshot shows a slide with the following content:

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 $\vec{a} \equiv \vec{b}$.

Then T has quantifier elimination.

Proof. Assume that T has the property in the statement of the 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 formula, with $\vec{w} = w_1, \dots, w_n$ the free variables. Let $\vec{c} = c_1, \dots, c_n$ 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

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

\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

- ▶ 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}
```

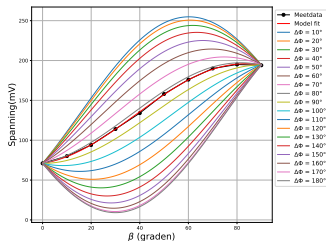
- 90% linewidth

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

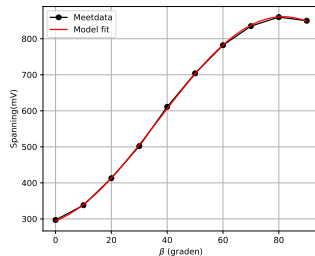
- Width maximally 90% linewidth and height maximally 5 cm

```
\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: Vectors

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

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

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

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

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

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

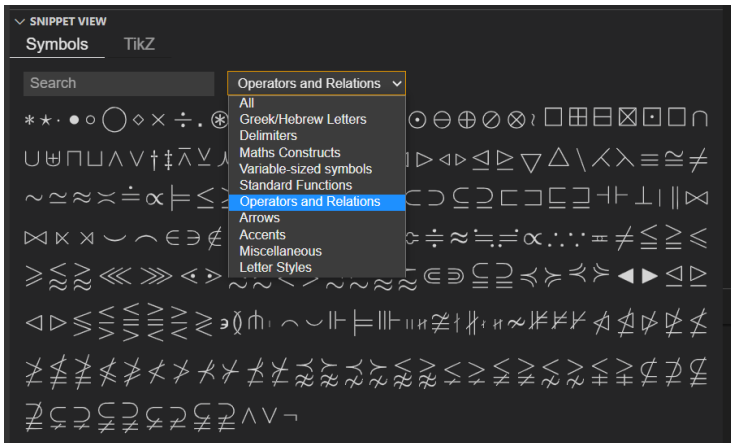
So many! And there are lots more :-)

CTAN symbol list:

[http://mirrors.ctan.org/info/symbols/comprehensive/
symbols-a4.pdf](http://mirrors.ctan.org/info/symbols/comprehensive/symbols-a4.pdf)

Detexify:

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



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}^{\phantom{x^2}\left|x=2\right.} = 4
\end{align*}
```

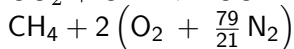
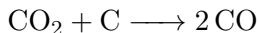
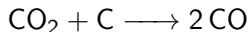
$$\left[x^2\right]\bigg|_{x=0}^{x=2} = 4,$$

```
\begin{align*}R(\backslash\theta) &= \begin{pmatrix}\cos(\backslash\theta) & -\sin(\backslash\theta)\backslash\backslash \\ \sin(\backslash\theta) & \cos(\backslash\theta)\end{pmatrix}, \quad \text{\quad}\\ \abs{x} &= \begin{cases}x & \text{\textit{if } $ x \geq 0$}}\\-x & \text{\textit{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
```



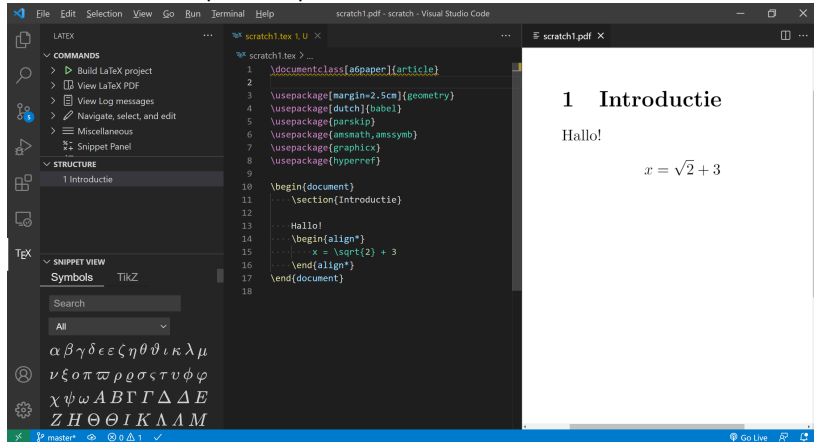
Some examples are taken from the `mhchem` package documentation (see below)

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

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

Installation

vkuhlmann.com/latex/installation



Sometimes you might need to compile multiple times.

Το τέλος

Questions?

Stuck? Mail me at
`vincent.kuhlmann@hotmail.com`

The slides can be found on
<https://vkuhlmann.com/latex>

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