GSNS LaTeX course

TeXniCie

8 September 2022

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Schedule

- Introduction to LaTeX and Overleaf
- Core concepts
- Text documents
- Math
- Closing remarks

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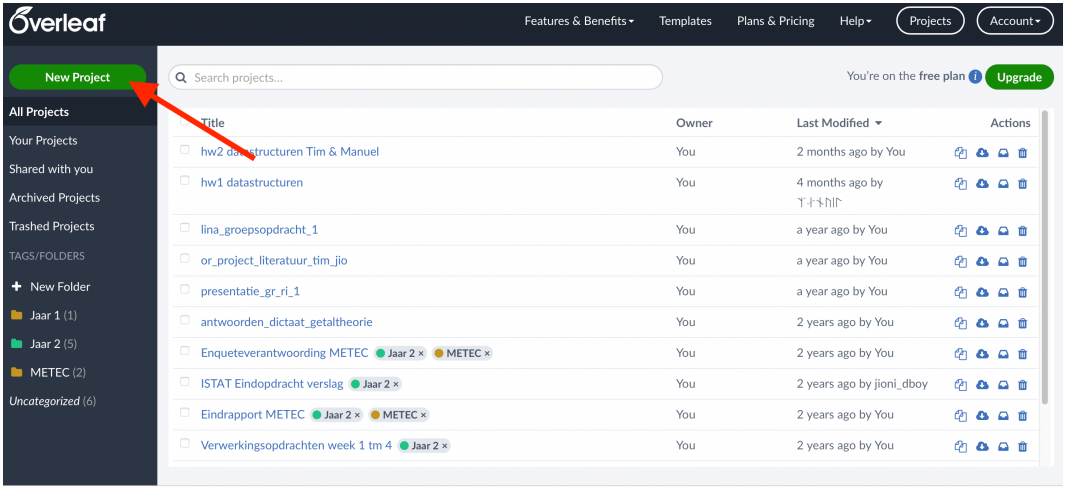
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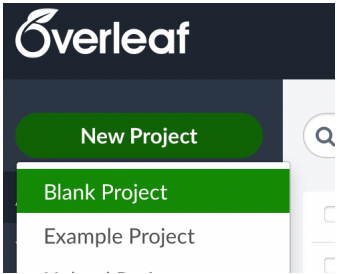
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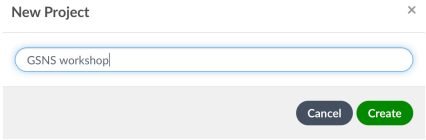
Example Project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Simple document in LaTeX

```
1  \documentclass{article}
2
3
4  \begin{document}
5
6
7
8
9
10
11
12
13 \end{document}
```

preamble: document settings go here

body: content (text and images) goes here

Simple document in LaTeX

```
1  \documentclass{article}
2
3
4  \begin{document}
5
6  The Differential and Integral
7  Calculus, or, as it was formerly
8  called in this country,
9  the Doctrine of Fluxions, has always
10 been supposed to present remarkable
11 obstacles to the beginner.
12
13 \end{document}
```

Example text: "Elementary Illustrations of the Differential and Integral Calculus" by Augustus De Morgan

body: content (text and images) goes here

Simple document in LaTeX

```
1  \documentclass[a4paper,11pt]{article}
2
3
4  \begin{document}
5
6  The Differential and Integral
7  Calculus, or, as it was formerly
8  called in this country,
9  the Doctrine of Fluxions, has always
10 been supposed to present remarkable
11 obstacles to the beginner.
12
13 \end{document}
```

preamble: document settings go here

Example text: "Elementary Illustrations of the Differential and Integral Calculus" by Augustus De Morgan

LaTeX commands

LaTeX commands begin with a backslash, followed by letters or a single special character.
Commands may have **arguments** and **optional arguments**.

```
\command
```

or

```
\command{argument}
```

or

```
\command[optional argument]{argument}
```

LaTeX commands

Some commands go in the **body** of the document

- The command `\LaTeX` prints the LaTeX logo and goes in the **body** of the document.
- `\newpage` starts a new page and it also goes in the **body** of the document.
- `\textbf{text}` is a command for **bold** text. The command takes 1 argument.
- `\sqrt[3]{y}` $\sqrt[3]{y}$ the square root command takes 1 argument and 1 optional argument

LaTeX commands

Other commands go in the **preamble** of the document

- `\title` sets the title of the document.
- `\usepackage{PACKAGENAME}` loads LaTeX code from other authors into your document. This code will often define new commands or tweak existing commands
- `\usepackage[paper=a5paper, margin=2cm, landscape=true]{geometry}` loads the geometry package with 3 optional arguments

Whitespace

- a␣␣␣␣␣b a b

Whitespace

- a␣␣␣␣␣b
- a\␣\␣\␣\␣\␣b

a b

a b

Whitespace

- a␣␣␣␣␣b
- a\␣\␣\␣\␣b
- a\quad␣b

a b

a b

a b

Whitespace

- `a␣␣␣␣␣b` → a b
- `a\␣\␣\␣\␣b` → a b
- `a\quad␣b` → a b
- `a\hspace␣{2cm}b` → a b

Whitespace

- `a␣␣␣␣␣b` → a b
- `a\␣\␣\␣\␣\␣b` → a b
- `a\quad␣b` → a b
- `a\hspace␣{2cm}b` → a b
- `\LaTeX␣is␣cool!` → LaTeX is cool!

Whitespace

- `a␣␣␣␣␣b` → a b
- `a\␣\␣\␣\␣b` → a b
- `a\quad␣b` → a b
- `a\hspace␣{2cm}b` → a b
- `\LaTeX␣is␣cool!` → LaTeXis cool!
- `\LaTeX␣{}␣is␣cool!` → LaTeX is cool!

Paragraphs

A paragraph consists of lines of text. Paragraph are separated by blank lines in code.

```
\documentclass[a4paper, 10pt]{article}
\begin{document}
The agitation for the Universal Colour Bill
continued for three years; and up to the
last moment of that period it seemed as
though Anarchy were destined to triumph.

A whole army of Polygons, who turned out
to fight as private soldiers, was utterly
annihilated by a superior force of Isosceles
Triangles --- the Squares and Pentagons
meanwhile remaining neutral.
\end{document}
```

Example text: "Flatland" by Edwin A. Abbott

The agitation for the Universal Colour Bill continued for three years; and up to the last moment of that period it seemed as though Anarchy were destined to triumph.

A whole army of Polygons, who turned out to fight as private soldiers, was utterly annihilated by a superior force of Isosceles Triangles — the Squares and Pentagons meanwhile remaining neutral.

Paragraphs

By default, new paragraphs are indented. To remove this indentation and insert a blank line insted, add the command `\usepackage{parskip}` to the preamble.

```
\documentclass[a4paper, 10pt]{article}
\usepackage{parskip}
\begin{document}
The agitation for the Universal Colour Bill
continued for three years; and up to the
last moment of that period it seemed as
though Anarchy were destined to triumph.

A whole army of Polygons, who turned out
to fight as private soldiers, was utterly
annihilated by a superior force of Isosceles
Triangles --- the Squares and Pentagons
meanwhile remaining neutral.
\end{document}
```

The agitation for the Universal Colour Bill continued for three years; and up to the last moment of that period it seemed as though Anarchy were destined to triumph.

A whole army of Polygons, who turned out to fight as private soldiers, was utterly annihilated by a superior force of Isosceles Triangles — the Squares and Pentagons meanwhile remaining neutral.

Sections

The \section{SECTIONNAME} command creates a heading. These headings are automatically numbered. Other headings are:

- \subsection{} , \subsubsection{} and \paragraph{}

```
\documentclass[a4paper]{article}
\begin{document}
\section{How I tried to teach the Theory of Three Dimensions to my
Grandson, and with what success}
I awoke rejoicing, and began to reflect on the glorious career before me.
I would go forth, methought, at once, and evangelize the whole of Flatland.
Even to Women and Soldiers should the Gospel of Three Dimensions
be proclaimed. I would begin with my Wife.
\end{document}
```

Example text: "Flatland" by Edwin A. Abbott

Title, author and date

We will now add a title to the article. We use three commands to set a **title**, **author** and **date**. These commands go in the **preamble**.
The command `\maketitle` goes in the **body** of the document and determines the position of the title.

```
1  \documentclass[a4paper, 12pt]{article}
2  \title{Elementary Illustrations of the Differential and Integral Calculus}
3  \author{Augustus De Morgan}
4  \date{November 11}
5  \begin{document}
6  \maketitle
7  The Differential and Integral Calculus, or, as it was formerly
8  called in this country, the Doctrine of Fluxions, has always
9  been supposed to present remarkable obstacles to the beginner.
10 \end{document}
```

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	<	<	<

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`	<	`<`	<

Formatting text

Result	Code	Result	Code
Text		`Text`	
Text		Text	
TEXT		Text	
Text		Text	

Formatting text

Result	Code	Result	Code
Text	`\textbf{Text}`	`Text`	
Text		Text	
TEXT		Text	
Text		Text	

bf = **b**old**f**ace | **it** = **it**alics | **sc** = **s**mall**c**aps | **tt** = **t**ele**t**ype (a.k.a. monospace)

Formatting text

Result	Code	Result	Code
Text	`\textbf{Text}`	`Text`	
Text	`\textit{Text}`	Text	
TEXT		Text	
Text		Text	

Formatting text

Result	Code	Result	Code
Text	`\textbf{Text}`	`Text`	
Text	`\textit{Text}`	Text	
TEXT	`\textsc{Text}`	Text	
Text		Text	

Formatting text

Result	Code	Result	Code
Text	`\textbf{Text}`	`Text`	
Text	`\textit{Text}`	Text	
TEXT	`\textsc{Text}`	Text	
Text	`\underline{Text}`	Text	

Formatting text

Result	Code	Result	Code
Text	`\textbf{Text}`	Text	`\texttt{Text}`
Text	`\textit{Text}`	Text	
TEXT	`\textsc{Text}`	Text	
Text	`\underline{Text}`	Text	

Formatting text

Result	Code	Result	Code
Text	`\textbf{Text}`	`Text`	`\texttt{Text}`
Text	`\textit{Text}`	Text	`{\tiny Text}`
TEXT	`\textsc{Text}`	Text	
Text	`\underline{Text}`	Text	

Formatting text

Result	Code	Result	Code
Text	`\textbf{Text}`	`Text`	`\texttt{Text}`
Text	`\textit{Text}`	Text	`{\tiny Text}`
TEXT	`\textsc{Text}`	Text	`{\LARGE Text}`
Text	`\underline{Text}`	Text	

Formatting text

Result	Code	Result	Code
Text	`\textbf{Text}`	Text	`\texttt{Text}`
Text	`\textit{Text}`	Text	`{\tiny Text}`
TEXT	`\textsc{Text}`	Text	`{\LARGE Text}`
Text	`\underline{Text}`	Text	

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

Formatting text

Result	Code	Result	Code
Text	`\textbf{Text}`	Text	`\texttt{Text}`
Text	`\textit{Text}`	Text	`{\tiny Text}`
TEXT	`\textsc{Text}`	Text	`{\LARGE Text}`
Text	`\underline{Text}`	Text	`\textcolor{red}{Text}` [1]

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

[1] `\usepackage{xcolor}`

Logical formatting

It's often better not to use the previous commands and follow the *logical formatting* philosophy of LaTeX.

	not logical	logical	Result
vector	`\textbf{w}`	`\vec{w}`	$\vec{w}$
emphasis	`\textit{text}`	`\emph{text}`	*text*
subheading	`\Large My Heading`	`\subsection{My Heading}`	My Heading
lemma	`\textsc{LEMMA 3.2}`	`\begin{mylemma}...\end{mylemma}`	LEMMA 3.2

Math

There are two ways to typeset math:

inline mode

The trigonometric identity is given by $\sin^2(\theta) + \cos^2(\theta) = 1$ for all θ.

display mode

The Pythagorean trigonometric identity is given by

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

The identity

$$1 + tan^2(\theta) = \frac{1}{cos^2\theta} \tag{2}$$

Is also called the Pythagorean trigonometric identity.

There is one way to typeset math in inline mode. But many **environments** in display mode.

Inline math

Text and symbols between \(and \) are treated as **math sybmols**.

```
\documentclass[a5paper]{article}
\begin{document}
The trigonometric identity is
given by \( \sin^2(\theta) + \cos^2(\theta) = 1 \). This identity is also
called the Pythagorean trigonometric identity.
\end{document}
```

The trigonometric identity is given by $\sin^2(\theta) + \cos^2(\theta) = 1$. This identity is also called the Pythagorean trigonometric identity.

Math packages

The following three packages are useful for typesetting mathematics:

```
\documentclass[a4paper, 10pt]{article}
\usepackage{amsmath}
\usepackage{amssymb}
\usepackage{amsthm}
\begin{document}
\[
    ax^2 + bx + c = 0 \qquad
    \text{the general form of the quadratic equation}
\]
\end{document}
```

These provide options for adding text to formulae, extra symbols such as $\boxplus$, $\rightsquigarrow$ and $\mathbb{R}$ and better theorem and proof environments.

Basic math

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

Basic math

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

Basic math

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

Basic math

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

Basic math

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

Basic math

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

Basic math

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

Basic math

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

Basic math

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

Basic math

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

`$ x^22 $`: x^22

Basic math

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

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

Display math

There are many display math environments. Today we focus on the **align** environment.

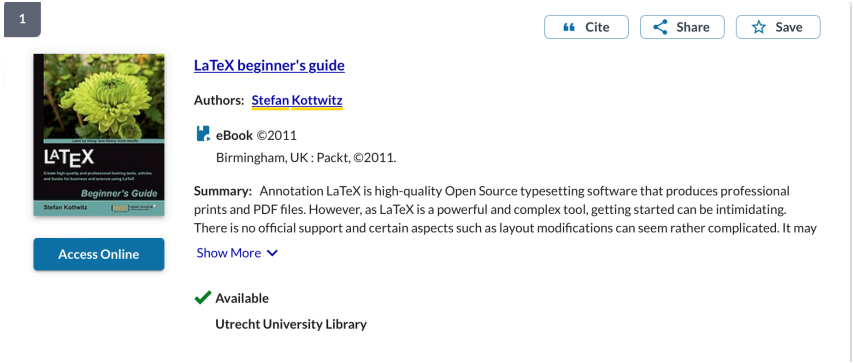
```
 The double angle formula can now be rewritten as
\begin{align}
    \cos(2\theta) &=  \cos^2\theta - sin^2\theta \\
                  &= 2\cos^2\theta - 1
\end{align}
```

The double angle formula can now be rewritten as

$$\cos(2\theta) = \cos^2\theta - sin^2\theta \tag{3}$$
$$= 2\cos^2\theta - 1 \tag{4}$$

Closing remarks

The best book for further learning is **LaTeX Beginner's Guide** by **Stefan Kottwitz**. The first edition is available as an eBook at the UU library.



Closing remarks

The TEXniCie organises a **thesis writing workshop** in februari 2023 and various other LATEX-workshops throughout the year. These will be announced on our website at

a-eskwadraat.nl/LaTeX

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