GSNS LaTeX course

TeXniCie

8 September 2022

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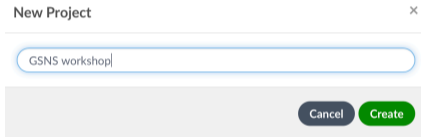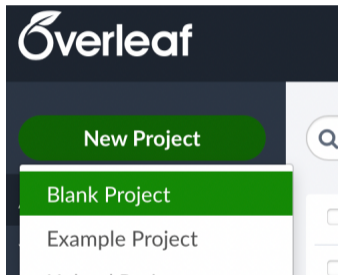
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Schedule

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

Overleaf

Overleaf

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

```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\␣\␣\␣\␣b   a   b
- a\quad␣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!   LaTeXis 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**{}

```
1  \documentclass[a4paper]{article}
2  \begin{document}
3  \section{How I tried to teach the Theory of Three Dimensions to my
4  Grandson, and with what success}
5  I awoke rejoicing, and began to reflect on the glorious career before me.
6  I would go forth, methought, at once, and evangelize the whole of Flatland.
7  Even to Women and Soldiers should the Gospel of Three Dimensions
8  be proclaimed. I would begin with my Wife.
9  \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		<big>Text</big>	
<u>Text</u>		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	
<u>Text</u>		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}`	<big>Text</big>	
<u>Text</u>	`\underline{Text}`	Text	

Formatting text

Result	Code	Result	Code
Text	`\textbf{Text}`	Text	`\texttt{Text}`
Text	`\textit{Text}`	Text	
TEXT	`\textsc{Text}`	Text	
<u>Text</u>	`\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}`
<u>Text</u>	`\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}`
<u>Text</u>	`\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**.

```
1  \documentclass[a5paper]{article}
2  \begin{document}
3  The trigonometric identity is
4  given by \( \sin^2(\theta) + \cos^2(\theta) = 1 \). This identity is also
5  called the Pythagorean trigonometric identity.
6  \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:

```latex
1   \documentclass[a4paper, 10pt]{article}
2   \usepackage{amsmath}
3   \usepackage{amssymb}
4   \usepackage{amsthm}
5   \begin{document}
6   \[
7       ax^2 + bx + c = 0 \qquad
8       \text{the general form of the quadratic equation}
9   \]
10  \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	
$\sqrt{2}$	$	$	$\sqrt[3]{8}$	$	$
$\frac{2}{3}$	$	$	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} $`	$\sqrt[3]{8}$	`$        $`
$\frac{2}{3}$	`$        $`	x_1	`$    $`
$6 \geq 3$	`$      $`	x_1^2	`$      $`
$a^2 + b^2$	`$        $`	a^{2+b^2}	`$        $`

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} $`	x_1	`$        $`
$6 \geq 3$	`$ 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 $`	x_1^2	`$         $`
$a^2 + b^2$	`$ 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 $`: $x^2 2$

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 $`: $x^2 2$ | `$ 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.

1

LaTeX beginner's guide

Authors: Stefan Kottwitz

eBook ©2011
Birmingham, UK : Packt, ©2011.

Summary: Annotation LaTeX is high-quality Open Source typesetting software that produces professional prints and PDF files. However, as LaTeX is a powerful and complex tool, getting started can be intimidating. There is no official support and certain aspects such as layout modifications can seem rather complicated. It may

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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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