

# LATEX

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2025 WINTER BLOCK WEEK

JOHN BROSZ – DATA & VISUALIZATION CURATOR, PHD (HAS WRITTEN A THESIS W/ LATEX)

JENNIFER LEE – COLLECTIONS, INTERIM HEALTH KNOWLEDGE NETWORK LIBRARIAN



**The University of Calgary, located in the heart of Southern Alberta, both acknowledges and pays tribute to the traditional territories of the peoples of Treaty 7, which include the Blackfoot Confederacy (comprised of the Siksika, the Piikani, and the Kainai First Nations), the Tsuut'ina First Nation, and the Stoney Nakoda (including Chiniki, Bearspaw, and Goodstoney First Nations). The City of Calgary is also home to the Métis Nation of Alberta (Districts 5 and 6).**



# Why you are here . . .

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- Getting started on a thesis
- Writing papers with LaTeX
- Bibliographies
- Something else entirely?



# Learning Objectives

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01

Become familiar with and know how to use the Overleaf interface for LaTeX

02

Be able to use the University of Calgary thesis template

03

Use LaTeX to include figures, tables, and generate a bibliography

# What is LaTeX?

LaTeX is a typesetting system that uses markup tagging to:

- Structure the document
- Stylize text
- Create citations and cross-references



# How does it work?

1. You create a plain text file encoding the LaTeX markup language
2. You use a compiler (e.g., MikTeX) process your text file and create your output document
3. You end up with a PDF file (or PS, dvi, html, rtf)

1 Text file (.tex)



```
\documentclass{article}
\usepackage{amsmath}
\title{\LaTeX}

\begin{document}
\maketitle
\LaTeX{} is a document preparation system for
the \TeX{} typesetting program. It offers
programmable desktop publishing features and
extensive facilities for automating most
aspects of typesetting and desktop publishing,
including numbering and cross-referencing,
tables and figures, page layout,
bibliographies, and much more. \LaTeX{} was
originally written in 1984 by Leslie Lamport
and has become the dominant method for using
\TeX; few people write in plain \TeX{} anymore.
The current version is \LaTeXe.

% This is a comment, not shown in final output.
% The following shows typesetting power of LaTeX:
\begin{align}
E_0 &= mc^2 \\
E &= \frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}}
\end{align}
\end{document}
```

2 Compiler



3 Resulting PDF

$\LaTeX$

$\LaTeX$  is a document preparation system for the  $\TeX$  typesetting program. It offers programmable desktop publishing features and extensive facilities for automating most aspects of typesetting and desktop publishing, including numbering and cross-referencing, tables and figures, page layout, bibliographies, and much more.  $\LaTeX$  was originally written in 1984 by Leslie Lamport and has become the dominant method for using  $\TeX$ ; few people write in plain  $\TeX$  anymore. The current version is  $\LaTeX 2_{\epsilon}$ .

$$E_0 = mc^2 \quad (1)$$

$$E = \frac{mc^2}{\sqrt{1 - \frac{v^2}{c^2}}} \quad (2)$$

Example from [Wikipedia](https://en.wikipedia.org/wiki/LaTeX) (<https://en.wikipedia.org/wiki/LaTeX>)

# Why is this Better Than MS-Word?

Bibliography and cross-references become simple

Figures & captions are better handled

Easier for complex mathematical equations

Reformatting documents

Separation of content and formatting can make  
working on a document easier

Easier to maintain consistent formatting

Vector graphics

Free, Open Source, & Stable (1994)

# Where is MS-Word better?

Track changes / Revisions & Commenting

Easier to learn, WYSIWYG (what you see is what you get)

You don't have to learn LaTeX error messages

Custom layout changes can be challenging in LaTeX

You're working with someone who does not want to learn LaTeX.



# Getting Started

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1. You need an editor for your text files
    - Notepad, VIM, emacs will be fine
    - Can get a purpose-built LaTeX editor such as [TEXnicCenter](https://www.texniccenter.org/) (<https://www.texniccenter.org/>)
  2. You need the LaTeX compiler
    - [MikTEX](https://miktex.org/) (<https://miktex.org/>) is a great version
      - Includes a package manager to install and use packages (packages add additional features to LaTeX)
  3. Use a Browser or Adobe Reader to view the resulting PDFs
  4. Use the UCalgary thesis formatting package
- OR
1. Do this all online using Overleaf (other are available including LyX, Papeeria, LaTeX Base, TexOnline)

The logo for Overleaf, featuring a stylized white leaf icon above the letter 'O' in the word 'Overleaf', which is written in a bold, white, sans-serif font. The logo is centered within a dark blue rectangular background.

**Overleaf**

# What is Overleaf?

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LaTeX editor

- Rich-text / WYSIWYG mode

Online

View PDF output

Many document types and journal templates

Other features, depending on subscription level

# Features (free & paid)

(<https://www.overleaf.com/user/subscription/plans>)

## Free features

- Unlimited private projects, real-time collaboration, templates, LaTeX editor

## Paid features (optional)

- Everything above plus: (real-time track changes), reference search, reference manager sync, full document history, Dropbox and GitHub integration, priority support

## Sharing

- Free: One collaborator
- Paid: 6 for student plans; 10 (“Standard”) or unlimited (“Professional”)



# Subscription models summary

	Monthly	Annual	# you can share with
Free	\$0	\$0	1*
Student	\$10	\$99	6
Standard	\$25	\$229	10
Professional	\$48	\$449	Unlimited

\* Login and see [user bonuses](https://www.overleaf.com/user/bonus)  
(<https://www.overleaf.com/user/bonus>)

# Your account

(Create one  
now!

Overleaf.com)

## Registration

- Register with any email
- ShareLaTeX: use existing account information

## Integrations and account linking include:

- ORCID ID
- GitHub (paid)
- Mendeley / Zotero (paid)

jenniferleeucalgary@gmail.com

[Account Settings](#)

[Subscription](#)

[Log Out](#)

# Account Settings

## Emails and Affiliations

Add additional email addresses to your account to access any upgrades your university or institution has, to make it easier for collaborators to find you, and to make sure you can recover your account.

**Email**

**Institution and role**

jenniferleeucalgary@gmail.com (primary)

Unconfirmed. Please check your inbox.

[Resend confirmation email](#)

[Add another email](#)

# Account settings

# Linking accounts (optional)

## Overleaf Beta Program

[Manage Beta Program Membership](#)

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## Sessions

[Manage Your Sessions](#)

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## Linked Accounts

You can link your Overleaf account with other services to enable the features described below

### Google

Log in with Google

[Link](#)

### Orcid

Securely establish your identity by linking your ORCID iD to your Overleaf account. Submissions to participating publishers will automatically include your ORCID iD for improved workflow and visibility.

[Link](#)

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Every few months we send a newsletter out summarizing the new features available. If you would prefer not to receive this email then you can unsubscribe at any time: [Unsubscribe](#)

Need to leave? [Delete your account](#)



# Create a new project

## Welcome to Overleaf!

New to LaTeX? Start by having a look at our [templates](#) or [LaTeX help guide](#)

Create First Project

Blank Project

Example Project

Upload Project

Import from GitHub

Templates

Academic Journal

Book

Formal Letter

Homework Assignment

Poster

Presentation

Project / Lab Report

Résumé / CV

Thesis

View All

The screenshot displays a LaTeX project window with the following components:

- Top Bar:** Includes 'Menu', 'Upgrade', 'Example project', 'J', 'Review', 'Share', 'Submit', 'History', 'Layout', and 'Chat'.
- Code Editor:** Shows LaTeX source code for 'main.tex'. The code includes package declarations, title, author, date, and content sections. A comment on line 17 explains the `\maketitle` command.
- File Outline:** Lists 'Introduction', 'Section 2', and 'Conclusion'. 'Section 2' is expanded to show 'Test subsection title:...' and 'What is this place?'.
- Preview Window:** Displays the rendered PDF output, including the title page, introduction, and section 2 with the equation  $E = mc^2$ .

The project window

# Menu

Sync

- Dropbox
- Git
- GitHub

Settings

Compiler: pdfLaTeX

TeX Live version: 2019

Main document: main.tex

Spell check: English

Auto-complete: On

Auto-close Brackets: On

Code check: On

Editor theme: textmate

Overall theme: Default

Keybindings: None

Font Size: 12px

Font Family: Lucida

Line Height: Compact

PDF Viewer: Built-In

Help

- Show Hotkeys
- Documentation
- Contact Us

Menu

Example project for GSW

Source Rich Text

main.tex

- references.bib
- universe.jpg

```
1 \documentclass{article}
2 \usepackage[utf8]{inputenc}
3
4 \title{Example project for GSW}
5 \author{jenniferleeucalgary}
6 \date{April 2020}
7
8 \usepackage{natbib}
9 \usepackage{graphicx}
10
11 \begin{document}
12
13 \maketitle
14
15 \section{Introduction}
16 There is a theory which states that if ever anyone discovered
17 the Universe is for and why it is here, it will instantly be
18 replaced by something even more bizarre and inexplicable.
19 There is another theory which states that this has already
20
21 \begin{figure}[h!]
22 \centering
23 \includegraphics[scale=1.7]{universe}
24 \caption{The Universe}
25 \label{fig:universe}
26 \end{figure}
27
28 \section{Conclusion}
29 ``I always thought something was fundamentally wrong with the
30 \cite{adams1995hitchhiker}
31
32 \bibliographystyle{plain}
33 \bibliography{references}
34 \end{document}
```

Example project for GSW

Source Rich Text

```
1 \documentclass{article}
2 \usepackage[utf8]{inputenc}
3
4 \title{Example project for GSW}
5 \author{jenniferleeucalgary, FredTheChicken}
6 \date{May 2020}
7
8 \usepackage{natbib}
9 \usepackage{graphicx}
10
11 \begin{document}
12
13 \maketitle
14
15 \section{Introduction}
16 There is a theory which states that if ever anyone discovers exactly what the Universe is for
17 and why it is here, it will instantly disappear and be replaced by something even more bizarre
18 and inexplicable.
19 There is another theory which states that this has already happened.
20 \section{Another section}
21
22 Skipping a line starts a new paragraph.
23 Typing on the next line in the Source window makes no difference to spacing within paragraphs.
24
25 An edit from jenniferleeucalgary. If more than one person is editing, you can see them typing,
26 and see where their colour-coded cursor is, much like in Google Docs.
27 Anyone with the "Anyone with this link can edit this project" link AND an account can edit and
```

Track changes is off >

This section needs a better title

Cancel Comment

Example project for GSW

jenniferleeucalgary

May 2020

## 1 Introduction

There is a theory which states that if ever anyone discovers exactly what the Universe is for and why it is here, it will instantly disappear and be replaced by something even more bizarre and inexplicable. There is another theory which states that this has already happened.

## 2 Another section

Skipping a line starts a new paragraph. Typing on the next line in the Source window makes no difference to spacing within paragraphs.

An edit from jenniferleeucalgary. If more than one person is editing, you can see them typing, and see where their colour-coded cursor is, much like in Google Docs.

Ab Review Share Submit

Recompile

# Review button

Click Review → highlight text → click Add Comment



# Share Project window via collaborator(s)

## Share Project



Link sharing is off, only invited users can view this project. [Turn on link sharing](#) ?

jenniferleeucalgary@gmail.com

Owner

Share with your collaborators

joe@example.com, sue@example.com, ...

Can Edit



Share

Close

**Share Project** ✕

Link sharing is off, only invited users can view this project. [Turn on link sharing ?](#)

---

jenniferleeucalgary@gmail.com Owner

---

Share with your collaborators

joe@example.com, sue@example.com, ...

Can Edit ▼ [Share](#)

[Close](#)

**Share Project** ✕

Link sharing is on. [Turn off link sharing ?](#)

Anyone with this link can edit this project

<https://www.overleaf.com/4893273922jbtmnrspnthq>

Anyone with this link can view this project

<https://www.overleaf.com/read/zwyryzgbmpjj>

---

jenniferleeucalgary@gmail.com Owner

---

Share with your collaborators

joe@example.com, sue@example.com, ...

Can Edit ▼ [Share](#)

[Close](#)

Share Project window via links

Menu Home Upgrade Example project J Review Share Submit History Layout Chat

> images Viewing 22nd December · 9:58 am 13 changes in main.tex All history Labels

main.tex Edited

```
1 \documentclass{article}
2 \usepackage[utf8]{inputenc}
3
4 \title{Example Project for January August 31 20243. This title changed
5 2023-1208-2230 Happy New Year!!}
6 \author{jenniferleeucalgary, FredTheChicken \thanks{funded by an extremely
7 wealthy benefactor who shall remain nameless}}
8 \date{JanuaryAugust 20243}
9
10 \usepackage{natbib}
11 \usepackage{graphicx}
12 % This package includes new commands, \includegraphics{...} and
    \graphicspath{...}
    % The command \graphicspath{ {images/} } tells LATEX that the images are
    kept in a folder named images under the current directory.
    % The \includegraphics{universe} command is the one that actually included
    the image in the document. Here universe is the name of the file containing the
```

Today

22nd December, 9:58 am

Edited main.tex

You

Label or download this version

Wed, 22nd Nov 23

22nd November, 3:56 pm

2023-12-21 x

Edited

# History

The screenshot shows a LaTeX editor interface with the following components:

- Top Bar:** Includes 'Menu', 'Upgrade', 'Example project', 'J', 'Review', 'Share', 'Submit', 'History', 'Layout', and 'Chat'.
- Toolbar:** Contains icons for file operations, editing, and a 'Recompile' button (circled in orange).
- Left Panel:** A file explorer showing a folder structure with 'main.tex' selected. A callout box states: "Add, create or organize documents (images, .tex files, etc.) here". Below it is a 'File outline' showing sections like 'Introduction' and 'Section 2'.
- Code Editor:** Displays LaTeX source code from line 1 to 18. A bracket labeled 'preamble' spans lines 8 to 12. Line 15 is highlighted with a red circle.
- Right Panel:** Shows the rendered PDF output of the code, including a title, author information, and two sections: '1 Introduction' and '2 Section 2'.

# Editing

New Project

All Projects

Your Projects

Shared with you

Archived Projects

Trashed Projects

ORGANIZE PROJECTS

+ New Tag

newFolderTest (0)

Uncategorized (6)

Are you affiliated with an institution?

Add Affiliation

Why do Fortune 500 companies and top research institutions trust Overleaf to streamline their collaboration? Get in touch to learn more.

Contact Sales

✕

## All Projects

You're on the free plan ? Upgrade

Search in all projects...

<input type="checkbox"/> Title	Owner	Last Modified ▾	Actions
<input type="checkbox"/> Example project	You	a minute ago by You	    
<input type="checkbox"/> University of Calgary Graduate Thesis (1)	You	2 years ago by You	    
<input type="checkbox"/> Natbib second example	You	3 years ago by You	    
<input type="checkbox"/> AIP	You	4 years ago by You	    
<input type="checkbox"/> University of Calgary Graduate Thesis	You	4 years ago by You	    
<input type="checkbox"/> test example 2	You	4 years ago by You	    

# Project management page

# LaTeX Commands

# Files

## Text file

- This is where all of your document and LaTeX commands go. E.g., thesis.tex

## Bib file

- This is where you provide all of your bibliography information. E.g., thesis.bib

## Pictures / Images

- Useful to put all of your image files for anything you want to include in the document in a folder. E.g., pictures\

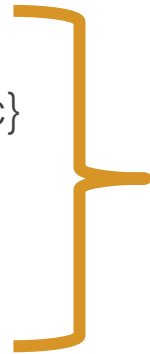
## Output

- Usually a PDF

# Basic Structure of your tex file

---

```
\documentclass{article}
\usepackage[utf8]{inputenc}
\title{TutorialExample}
\author{John Brosz}
\date{May 2020}
```



← Preamble (document setup)

```
\begin{document}
\maketitle
\section{Introduction}
This is a first example.
% This is a sentence that I'm not sure if I want to
delete so I've just commented it out instead.
\end{document}
```



Document body (text)



# Basic File Structure

---

```
\documentclass{article}
\usepackage[utf8]{inputenc}
\title{TutorialExample}
\author{John Brosz}
\date{May 2020}

\begin{document}
\maketitle
\section{Introduction}
This is a first example.
% This is a sentence that I'm not sure if I want to
delete so I've just commented it out instead.
\end{document}
```



# Basic File Structure

---

```
\documentclass{article}
\usepackage[utf8]{inputenc}
\title{TutorialExample}
\author{John Brosz}
\date{May 2020}
```

Document class  
Package  
Specifying authorship metadata

```
\begin{document}
\maketitle
\section{Introduction}
This is a first example.
% This is a sentence that I'm not sure if I want to
delete so I've just commented it out instead.
\end{document}
```

Instruction to create a title  
Section heading  
Commented out text. Does not appear in the final document but useful for notes to self, keeping old versions, etc.

# Classes

---

Class – controls the overall layout and structure (e.g., document template)

- UCalgary thesis class (more on this two slides from now)

How to find classes:

- Overleaf templates: <https://www.overleaf.com/latex/templates>
- CTAN (Comprehensive TeX Archive Network) <https://www.ctan.org/> is a comprehensive listing of 5800+ packages

# Classes

---

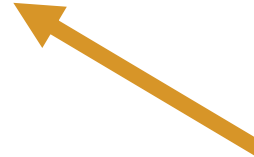
`\documentclass[12pt, letterpaper]{article}`



Only appears once,  
must be in preamble



Options



Class name: *article*

Look-up options in CTAN  
E.g., documentation for the *article* class

```
74 (*article)
75 \ExecuteOptions{letterpaper, 10pt, onese, onecolumn, final}
76 (/article)
77 (*report)
78 \ExecuteOptions{letterpaper, 10pt, onese, onecolumn, final, openany}
79 (/report)
80 (*book)
81 \ExecuteOptions{letterpaper, 10pt, twoside, onecolumn, final, openright}
82 (/book)
```

from <https://mirror.its.dal.ca/ctan/macros/latex/base/classes.pdf>

# University of Calgary Thesis Class

---

Template from the Faculty of Science (based on 2014 thesis guidelines)

<https://science.ucalgary.ca/sites/default/files/teams/7/ucalgary-thesis-master.zip>

<https://www.overleaf.com/latex/templates/university-of-calgary-thesis-template/zgjghsjjhmnj>

Version with some improvements by Mark Girard, now a Post-Doc at University of Waterloo (2016)

<https://github.com/markwgirard/ucalgarythesis>

<https://www.overleaf.com/latex/templates/university-of-calgary-thesis-template/jddnhskkgpms>

More readable template version created by Richard Zach, UCalgary Professor (Philosophy) (2018, 2023)

<https://richardzach.org/2018/03/26/a-new-university-of-calgary-latex-thesis-class-based-on-memoir/>

-> website provides a description of what has been improved

<https://www.overleaf.com/latex/templates/university-of-calgary-graduate-thesis/hwksvncryfzn>

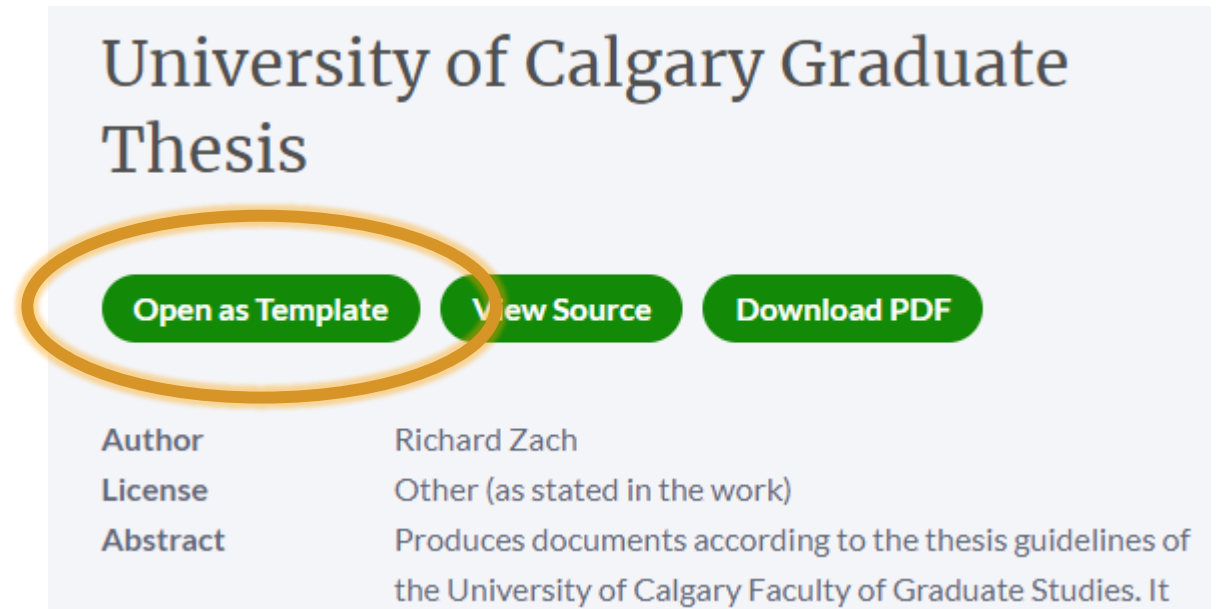
# Overleaf

Go to

<https://www.overleaf.com/latex/templates/university-of-calgary-graduate-thesis/hwksvncryfzn>

Pick the thesis template by Richard Zach

Open as Template



The screenshot shows a card for a thesis template. At the top, the title 'University of Calgary Graduate Thesis' is displayed. Below the title are three green buttons: 'Open as Template', 'View Source', and 'Download PDF'. The 'Open as Template' button is circled in orange. Below the buttons, the author 'Richard Zach' is listed, along with the license 'Other (as stated in the work)' and a short abstract: 'Produces documents according to the thesis guidelines of the University of Calgary Faculty of Graduate Studies. It

# Commands and Environments

---

`\commandname[options]{arguments}`

Examples:

`\itemize` First ingredient

`\center`

`\textbf{Make it so!}`

`\begin{environmentname}[options]{arguments}`

*Content goes here.*

`\end{environmentname}`

Examples:

`\begin{center}`

text

`\end{center}`

`\begin{textit}`

This text is italicized.

`\end{textit}`

# Common Commands & Environments

---

## Font size

- `\tiny`
- `\small`
- `\normalsize`
- `\large`
- `\huge`
- `\section*{title}`

## Font Properties

- Bold: `\textbf{}`
- Italics: `\textit{}`
- Underline: `\underline{}`
- Small caps: `\textsc{}`

## Structure

- `\part{title}`
- `\section{title}`
- `\subsection{title}`
- `\chapter{title}`

## Justification

- Center: `\centering`  
`\begin{center}`
  - `\end{center}`
- Align left: `\raggedright`  
`\begin{flushleft}`
- Align right: `\raggedleft`  
`\begin{flushright}`

## Symbols: precede with \

- `&` `\&`
- `$` `\$`
- `%` `\%`
- `...` `\dots`
- `\` `\textbackslash`
- `}` `\}`
- `{` `\{`

◦ “quotes”



# Paragraphs & Comments

---

This is the first paragraph.

This is still in the first paragraph.

Finally, the second paragraph.

% This is a comment

% /command that doesn't work

% remember to insert a figure here

% This is the old version of paragraph 2, I'm keeping it because maybe I still want it. Paragraph 2 is awesome.

# Figures

---

```
\usepackage{graphicx}
% can use \graphicspath{ {./images/} } so you don't
% have to provide the image path every time
\begin{document}
The universe is immense and it seems to be
homogeneous, in a large scale, everywhere we look at.

\includegraphics{images/universe.jpg}

There's a picture of a galaxy above
\end{document}
```

The universe is immense and it seems to be homogeneous, in a large scale,  
everywhere we look at.



There's a picture of a galaxy above

Works for jpg, png, and pdf.

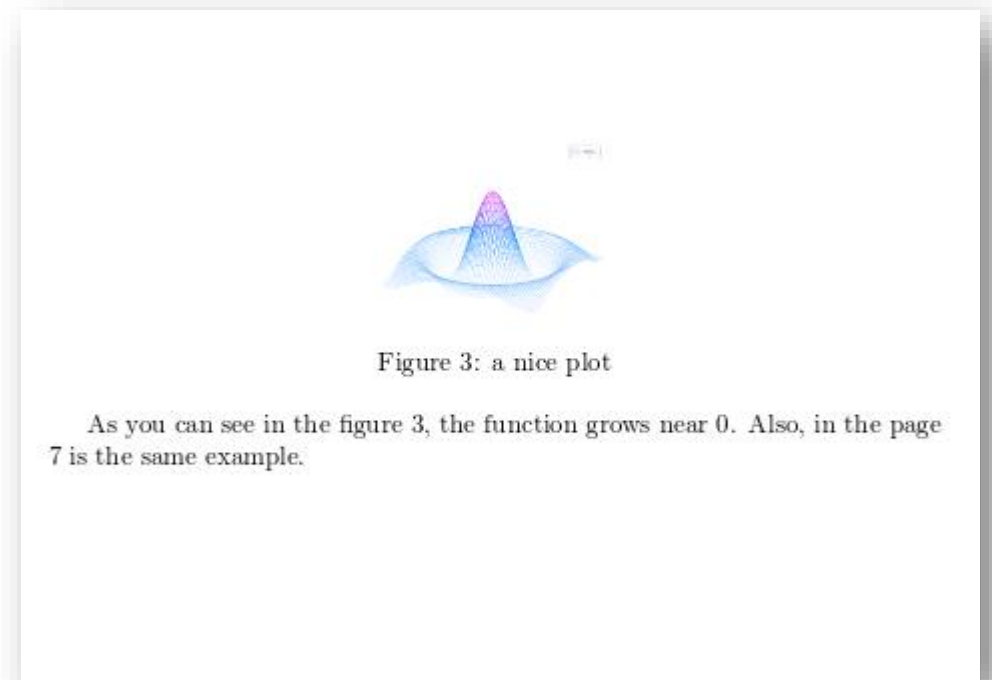
# Figures

---

We don't just want an image, usually we want a number Figure with a caption that we can position in our document

```
\begin{figure}[h] ← h = here      p = own page
  \centering      t = top        !
                 b = bottom
  \includegraphics[width=0.25\textwidth]{mesh.jpg}
  \caption{a nice plot}
  \label{fig:mesh1}
\end{figure}
```

As you can see in the figure `\ref{fig:mesh1}`, the function grows near 0. Also, in the page `\pageref{fig:mesh1}` is the same example.



# Figures

---

We don't just want an image, usually we want a number Figure with a caption that we can position in our document

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

```
\centering
```

```
\includegraphics[width=0.25\textwidth]{mesh.jpg}
```

```
\caption{a nice plot}
```

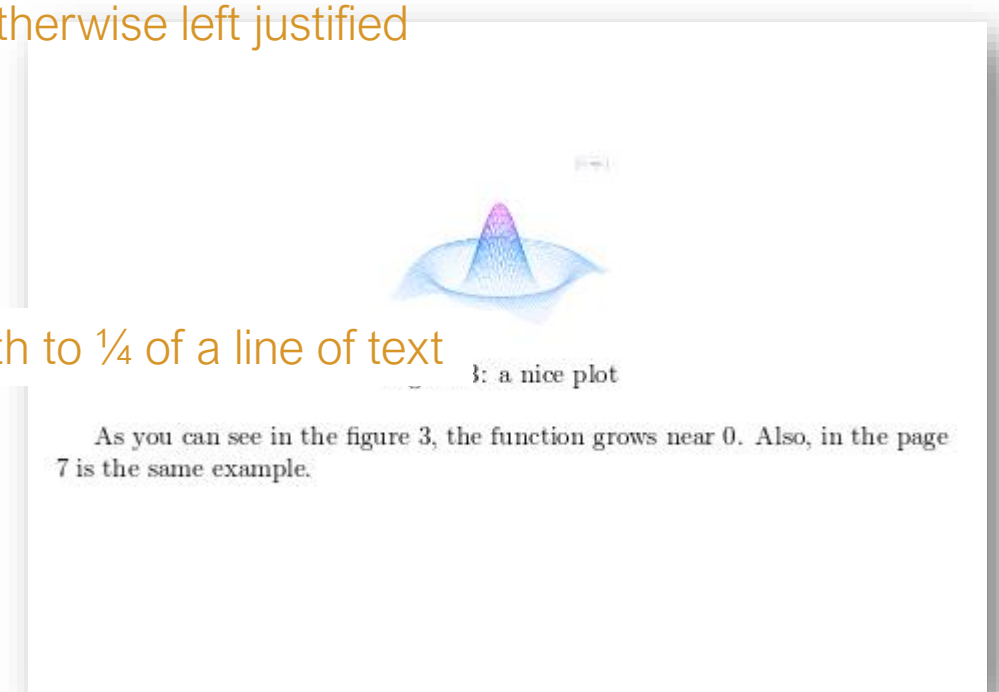
```
\label{fig:mesh1}
```

```
\end{figure}
```

Center everything that follows, otherwise left justified

How big? Set the width to  $\frac{1}{4}$  of a line of text

As you can see in the figure `\ref{fig:mesh1}`, the function grows near 0. Also, in the page `\pageref{fig:mesh1}` is the same example.



# Figure Sizes

---

`[width=3cm]` 3cm wide, calculate height to maintain aspect ratio

- Also: pt, mm, cm, in, em (width of the m character in current font), ex (height of the x character)

`[width=\textwidth]` use the space available for a single line of text at this point in the document

- Also: `\columnwidth` `\columnsep` `\linewidth` `\textheight` `\paperheight` `\paperwidth`

`[width=3cm; height=2cm]` overrides the image's aspect ratio to give exact dimensions.

# Figures

---

We don't just want an image, usually we want a number Figure with a caption that we can position in our document

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

```
\centering
```

```
\includegraphics[width=0.25\textwidth]{mesh.jpg}
```

```
\caption{a nice plot}
```

```
\label{fig:mesh1}
```

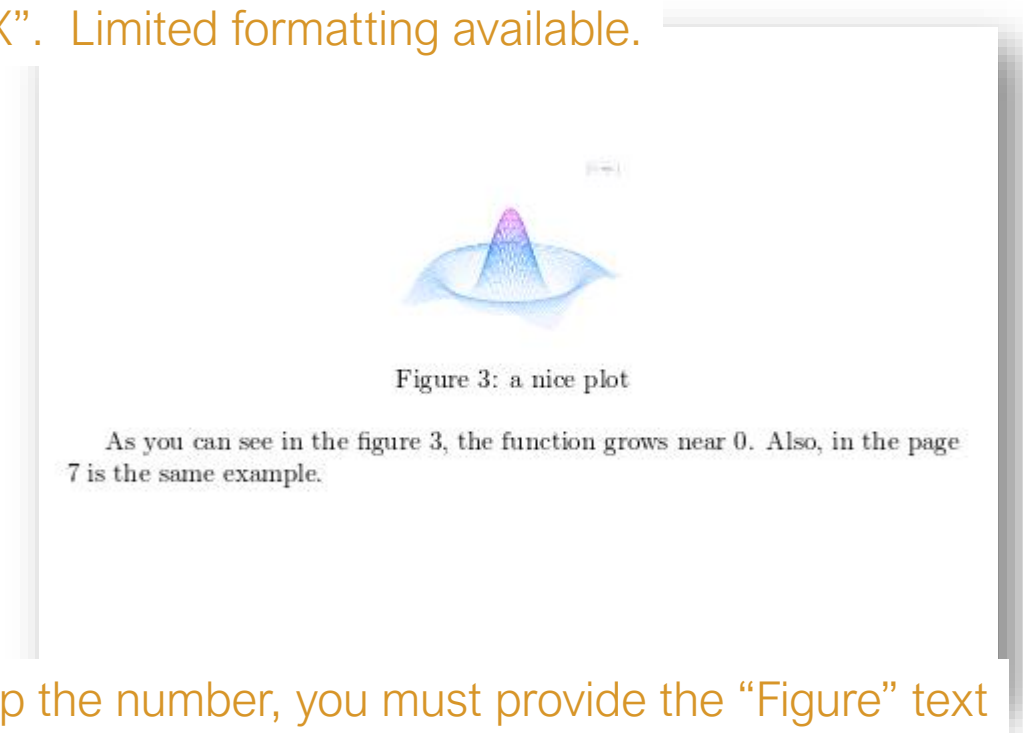
```
\end{figure}
```

Caption. Auto-add the "Figure X". Limited formatting available.

A name you'll remember.

As you can see in the figure `\ref{fig:mesh1}`, the function grows near 0. Also, in the page `\pageref{fig:mesh1}` is the same example.

Ref = reference. It will lookup the number, you must provide the "Figure" text



# Bullet Lists

Bulleted list:

```
\begin{itemize}  
  \item apples  
  \item bananas  
  \item oranges  
\end{itemize}
```

Numbered list:

```
\begin{enum}
```

# Mathematical Equations

---

## Inline

In physics, the mass-energy equivalence is stated by the equation  $E=mc^2$ , discovered in 1905 by Albert Einstein.

In physics, the mass-energy equivalence is stated by the equation  $E = mc^2$ , discovered in 1905 by Albert Einstein.

## Stand alone

The mass-energy equivalence is described by the famous equation

$$E=mc^2$$

discovered in 1905 by Albert Einstein.

In natural units ( $c = 1$ ), the formula expresses the identity

$$E=m$$

The mass-energy equivalence is described by the famous equation

$$E = mc^2$$

discovered in 1905 by Albert Einstein. In natural units ( $c = 1$ ), the formula expresses the identity

$$E = m \tag{1}$$



# Mathematical Equations

---

Subscripts in math mode are written as  $a_b$  and superscripts are written as  $a^b$ . These can be combined and nested to write expressions such as

```
\[ T^{i_1 i_2 \dots i_p}_{j_1 j_2 \dots j_q} =
T(x^{i_1}, \dots, x^{i_p}, e_{j_1}, \dots, e_{j_q}) \]
```

We write integrals using  $\int$  and fractions using  $\frac{a}{b}$ . Limits are placed on integrals using superscripts and subscripts:

```
\[ \int_0^1 \frac{dx}{e^x} = \frac{e-1}{e} \]
```

Lower case Greek letters are written as  $\omega$   $\delta$  etc. while upper case Greek letters are written as  $\Omega$   $\Delta$   $\Delta$ .

Mathematical operators are prefixed with a backslash as  $\sin(\beta)$ ,  $\cos(\alpha)$ ,  $\log(x)$  etc.

Subscripts in math mode are written as  $a_b$  and superscripts are written as  $a^b$ . These can be combined and nested to write expressions such as

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Mathematical operators are prefixed with a backslash as  $\sin(\beta)$ ,  $\cos(\alpha)$ ,  $\log(x)$  etc.

# Tables: A Sample Table

---

`\begin{tabular}{ c c c }` ← 3 columns, centered. Could be r = right or l = left.

`\centering` ← `&` = Separator between cells

`cell1 & cell2 & cell3 \\`

`cell4 & cell5 & cell6 \\` ← `\\` = End of row

`cell7 & cell8 & cell9`

`\end{tabular}`

<b>cell1</b>	<b>cell2</b>	<b>cell3</b>
<b>cell4</b>	<b>cell5</b>	<b>cell6</b>
<b>cell7</b>	<b>cell8</b>	<b>cell9</b>



# Tables: More Complexity

---

```
\begin{tabular}{||c c c c||}
```

```
\hline
```

```
Col1 & Col2 & Col2 & Col3 \\ [0.5ex]
```

```
\hline\hline
```

```
1 & 6 & 87837 & 787 \\
```

```
\hline
```

```
2 & 7 & 78 & 5415 \\
```

```
\hline ← Horizontal border line
```

```
3 & 545 & 778 & 7507 \\
```

```
\hline
```

```
4 & 545 & 18744 & 7560 \\
```

```
\hline
```

```
5 & 88 & 788 & 6344 \\ [1ex]
```

```
\hline
```

```
\end{tabular}
```

|| = draw double-border; also | draw single border before/after column

Adds a vertical space (1/2 the height of an 'x')

Col1	Col2	Col2	Col3
1	6	87837	787
2	7	78	5415
3	545	778	7507
4	545	18744	7560
5	88	788	6344

# References & Bibliography

---

## Preamble

```
\usepackage[round]{natbib}  
\bibliographystyle{plainnat}
```

← Using natbib references, also bibtex or biblatex

← Change this to change the style of your bibliography

## Document

See [https://www.overleaf.com/learn/latex/Natbib\\_bibliography\\_styles](https://www.overleaf.com/learn/latex/Natbib_bibliography_styles)

According to research by Authors `\ref{author:coolpaper}` this is a good way of doing things.

Research by OtherAuthors `\cite{author:coolpaper}` this is a good way of doing things.

End of Document (wherever you want the bibliography to appear)

```
\bibliography{mybibfilename}
```

← Your .bib file that contains the reference information

\* You will need to compile two times when you update your bib file.

# .bib files

---

```
@Book{Lamport1986,  
  author = {Leslie Lamport},  
  title = {LaTeX: A Document Preparation System},  
  publisher = {Addison-Wesley},  
  year = 1986,  
  address = {Reading, Mass.}  
}  
  
@Book{Knuth1986,  
  author = {Donald E. Knuth},  
  title = {The TeXbook},  
  publisher = {Addison-Wesley},  
  year = 1986  
}  
  
@booklet{Wilson2016,  
  author = {Peter Wilson},  
  title = {The Memoir Class for Configurable Typesetting},  
  url = {https://ctan.org/pkg/memoir?lang=en},  
  year = 2016  
}
```

## Software to help:

JabRef <https://www.jabref.org/>

CiteDrive <https://app.citedrive.com/>

EndNote

- Edit – Output Styles – Open Style Manager
- BibTeXExport

# Packages

---

Package – adds features to provide different possibilities.

- Hyperref – support for links in your document. E.g., URLs, link citation to bibliography entries, etc.

How to find packages:

- CTAN (Comprehensive TeX Archive Network) <https://www.ctan.org/> is a comprehensive listing of 5800+ packages
- Overleaf documentation: <https://www.overleaf.com/learn>
- Google – latex how do I ...

# Packages

## Bibliography

Donald E. Knuth. *The TeXbook*. Addison-Wesley, Boston, 1986.

Leslie Lamport. *LaTeX: A Document Preparation System*. Addison-Wesley, Reading, Mass., 1986.

Peter Wilson. The memoir class for configurable typesetting, 2016. URL: <https://ctan.org/pkg/memoir?lang=en>.

```
\usepackage[colorlinks,allcolors=MidnightBlue]{hyperref}
```

Must be in preamble

Options

Package name: *hyperref*

E.g., documentation for the *hyperref* class from <https://ctan.org/pkg/hyperref>

### 3 Package options

All user-configurable aspects of *hyperref* are set using a single 'key=value' scheme (using the `keyval` package) with the key `Hyp`. The options can be set either in the optional argument to the `\usepackage` command, or using the `\hypersetup` macro. When the package is loaded, a file `hyperref.cfg` is read if it can be found, and this is a convenient place to set options on a site-wide basis.

Note however that some options (for example `unicode`) can only be used as package options, and not in `\hypersetup` as the option settings are processed as the package is read.

As an example, the behavior of a particular file could be controlled by:

```
a site-wide hyperref.cfg setting up the look of links, adding backreferencing, and setting a PDF display default:\hypersetup{backref,
pdfpagemode=FullScreen,
colorlinks=true}
```

A global option in the file, which is passed down to `hyperref:documentclass[dvips]{article}`

```
File-specific options in the \usepackage commands, which override the ones set in hyperref.cfg:\usepackage[colorlinks=false]{hyperref}
\hypersetup{pdftitle={A Perfect Day}}
```



# Debugging

---

Read the error message, pay attention to which line is the problem

---

If you're not sure, try commenting out lines until you've pinpointed the problem

---

Watch out that you always match `\begin{xyz}` with an `\end{xyz}`. These problems can be a headache to track down.

---

Google: latex "my error message"

---

Warnings vs Errors (you can ignore warnings)

# Extra Resources, Help

## Overleaf documentation/help

- Many “old” resources on the web, Overleaf documentation is current

## Stack Exchange

- <https://tex.stackexchange.com/>

## Reference Sheet

- <https://github.com/wch/latexsheet/blob/gh-pages/latexsheet.pdf>

# Good Luck, Happy Writing!

---

If you end up stuck with a LaTeX problem, feel free to get in touch.

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John Brosz

[jdlbrosz@ucalgary.ca](mailto:jdlbrosz@ucalgary.ca)

