

EBESS and MESS Presents: Learn to LaTeX

Presented by Joshua Tambunan

13 February 2018



Structure of the Night

- Basics of LaTeX
- Motivation
- What?
- Why?

Intro

Syntax

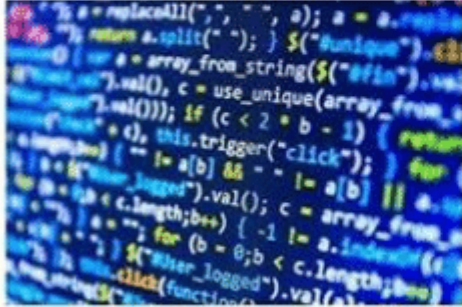

Format

Advanced

Pizza

Structure of the Night

- Starting a document
- Commenting
- Curly bois
- **Bold**, *italics* & underline
- Basic Maths

WHO WOULD WIN?	
a computer program with millions of lines of code	one C U R L Y B O Y with no friend
	
{	

Intro

Syntax

Format

Advanced

Pizza

Structure of the Night

- Document structure
- Tables
- Lists
- Bibliography & citation

Intro

Syntax

Format

Advanced

Pizza

Structure of the Night

- Packages and libraries
- Some meaty maths
- Some useful packages
- Practical interactions
- Challenge

Intro

Syntax

Format

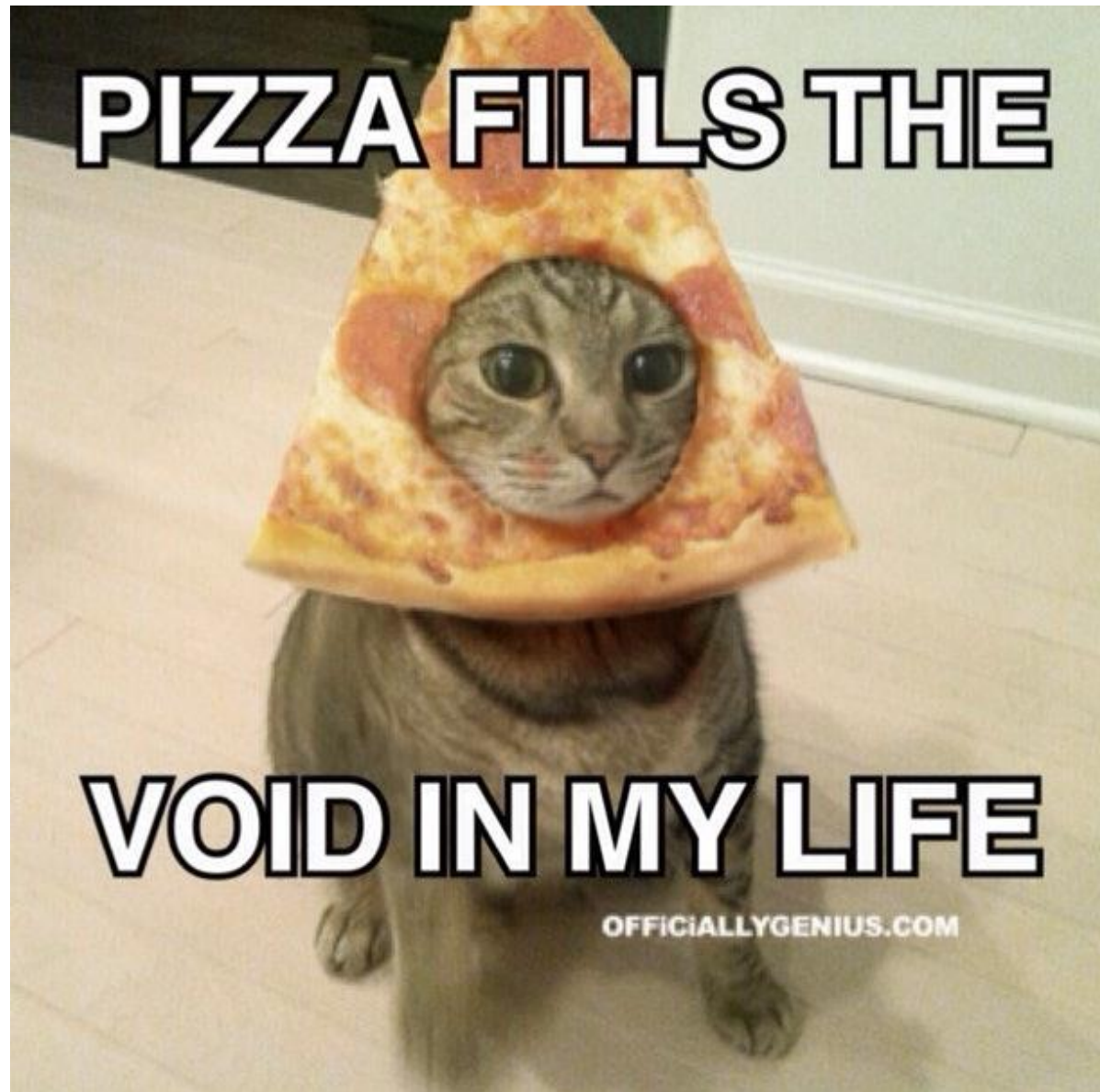
Advanced

Pizza

PIZZA FILLS THE

VOID IN MY LIFE

OFFICIALLYGENIUS.COM





What is LaTeX

- Lay-tek or lah-tek
- WYSIWYM

Intro

Syntax

Format

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Pizza

What it is

- Document preparation
- Typesetting
- Professional finish
- Free software license –
 - latex-project.org/lppl.txt

Intro

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3 Mathematical Equations

Simple equations, like x^y or $x_n = \sqrt{a+b}$ can be typeset right in the text line by enclosing them in a pair of single dollar sign symbols. Don't forget that if you want a real dollar sign in your text, like \$2000, you have to use the `\$` command.

A more complicated equation should be typeset in *displayed math* mode, like this:

$$z \left(1 + \sqrt{\omega_{i+1} + \zeta - \frac{x+1}{\Theta+1}y + 1} \right)$$

The "equation" environment displays your equations, and automatically within your document, like this:

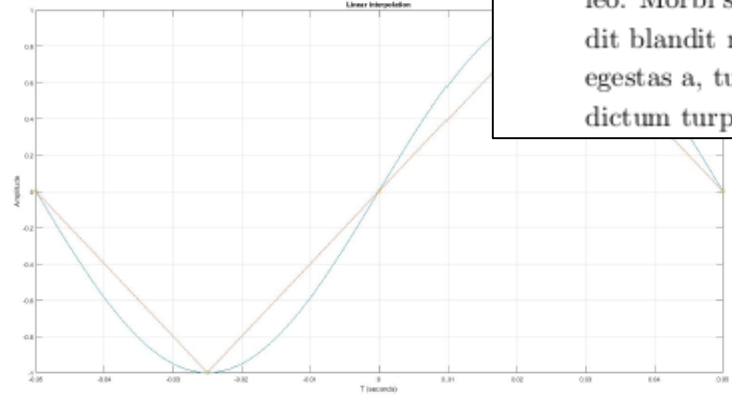
$$\left[\frac{N}{1} \right]$$

5. Sampling and Windowing

In sampling theory, in order to accurately characterise the behavior be true: the sampling frequency f_s must be more than $2f_{max}$, where the signal being sampled (Nyquist theorem). In practice, there is still wave even after using a sampling rate which satisfies the Nyquist or oversampling (upsampling the original sampler) and windowing is u

Linear interpolation is sampling at a certain rate, obtaining p and connecting those points with straight lines from one to the other

With a 10Hz sinusoid signal, sampling at 50Hz and reconstructing interpolation produces the following:



Given that there was no phase shift in the sampler relative to the original signal, the above could be reconstructed. Even without a phase shift, significant distortion can be seen: the sine wave is reconstructed as a triangle wave.

A Minimal Working Example

by Fran

February 24, 2013

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.



Figure 1: Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante.

What it isn't

- Coding-free
- Learning curve-free
- A fast, lazy method

Intro

Syntax

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FAQ

- Coding skills
- Time
- Why



Intro

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Motivation

- Common Applications
 - Assignments
 - Project reports
 - Thesis
 - Grocery list
 - Facebook

Intro

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15:01

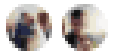
Emie

Ok what's the equation about

I am being a dumb dumb right now and can't figure it out

$$x^n + y^n = z^n$$

It works!



Pythagoras, fam.

Basic Syntax

```
\documentclass[12pt]{article}  
\usepackage[utf8]{inputenc}  
  
\title{My First LaTeX Document}  
\author{Joshua Tambunan}  
\date{February 2017}
```

Intro

Syntax

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Let's Get Started!

- Laptop/Desktop
- Download an IDE:
 - TeXworks
 - TeXstudio
 - TeXlipse (plugin for Eclipse IDE)
- OR use an online editor:
 - ShareLatex

Intro

Syntax

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Document Structure

- Preamble
- Main body

Intro

Syntax

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Pizza

Preamble

```
\documentclass[12pt]{article}  
\usepackage[utf8]{inputenc}  
  
\title{My First LaTeX Document}  
\author{Joshua Tambunan}  
\date{February 2017}
```

Intro

Syntax

Format

Advanced

Pizza

Main Body

```
\begin{document}
```

```
\maketitle
```

We have now added a title, author and date to our first `\LaTeX{}` document!

```
\end{document}
```

Intro

Syntax

Format

Advanced

Pizza

Comments

```
\begin{document}
```

```
\maketitle
```

We have now added a title, author and date to our first `\LaTeX{}` document!

```
% This line here is a comment. It will not be  
printed in the document.
```

```
\end{document}
```

Intro

Syntax

Format

Advanced

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Bold, italics and underlining

```
Some of the \textbf{greatest}
discoveries in
\underline{science} were made by
\textit{accident}.
```

Intro

Syntax

Format

Advanced

Pizza

Emphasis I

```
Some of the greatest  
\emph{discoveries} in  
science were made by  
accident.
```

Intro

Syntax

Format

Advanced

Pizza

Emphasis II

```
\textit{Some of the  
greatest  
\emph{discoveries} in  
science were made by  
accident. }
```

Intro

Syntax

Format

Advanced

Pizza

Emphasis III

```
\textbf{Some of the  
greatest  
\emph{discoveries} in  
science were made by  
accident. }
```

Intro

Syntax

Format

Advanced

Pizza



```
\usepackage{graphicx}
```

Images I

```
\documentclass{article}
\usepackage{graphicx}
\graphicspath{ {images/} }

\begin{document} I've heard of this really good
EBESS networking event.

\includegraphics{employ.png}    There's a picture
of a really employable student!
\end{document}
```

Intro

Syntax

Format

Advanced

Pizza

Images II

```
\begin{figure}[h] \centering
  \includegraphics[width=0.25\textwidth]{mesh.png}
  \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.

Intro

Syntax

Format

Advanced

Pizza

Mathematics (and curlyboys)

- Inline
- Display
 - Numbered
 - Unnumbered

Intro

Syntax

Format

Advanced

Pizza

Maths - Inline

Was ENGG1300 that subject that had $V = IR$? I can't remember. I was always hungover from EBESS parties. I know that $(F = ma)$. Is that the same thing?

Intro

Syntax

Format

Advanced

Pizza

Maths - Display

The only equation that made sense to me in fluids is $P = \rho gh$ Ok, that's a lie. I understood the potential equation:

```
\begin{equation}
    \frac{\delta \phi}{\delta x} = -u
\end{equation}
```

Intro

Syntax

Format

Advanced

Pizza

Maths - Display Summary

We can write

```
$$\Omega = \sum_{k=1}^n \omega_k$
```

In text, or we can write

```
\begin{equation}
```

```
    \Omega = \sum_{k=1}^n \omega_k
```

```
\end{equation}
```

to display it.

Intro

Syntax

Format

Advanced

Pizza

Formatting

- Abstracts
- Paragraphs and newlines
- Chapters and sections
- Tables

Intro

Syntax

Format

Advanced

Pizza

Abstracts

```
\begin{document}
```

```
\begin{abstract}
```

```
This is the abstract of my thesis. A  
compulsory thesis means I have the right  
to be an elitist to all the other  
engineering majors.
```

```
\end{abstract}
```

```
\end{document}
```

Intro

Syntax

Format

Advanced

Pizza

Paragraphs and newlines

```
\begin{document}
This is my first paragraph.
This is still my first paragraph.

My second paragraph.\\
My third paragraph.
\newpage

My fourth paragraph on a new page.
\end{document}
```

Intro

Syntax

Format

Advanced

Pizza

Chapters and Sections I

```
\chapter{First Chapter}
```

```
\section{Introduction}
```

```
This is the first section. Lorem ipsum dolor  
sit amet, consectetur adipiscing elit. Etiam  
lobortis facilisis sem. Nullam nec mi et neque  
pharetra sollicitudin. Praesent imperdiet mi  
nec ante. Donec ullamcorper, felis non  
sodales...
```

Intro

Syntax

Format

Advanced

Pizza

Chapters and Sections II

```
\section{Second Section} Lorem ipsum dolor  
sit amet, consectetur adipiscing elit. Etiam  
lobortis facilisissem. Nullam nec mi et neque  
pharetra sollicitudin. Praesent imperdiet mi  
necante...
```

```
\subsection{First Subsection} Praesent  
imperdietmi nec ante. Donec ullamcorper, felis  
non sodales...
```

Intro

Syntax

Format

Advanced

Pizza

Chapters and Sections III

```
\section*{Unnumbered Section} Lorem ipsum  
dolor sit amet, consectetur adipiscing elit.  
Etiam lobortis facilisissem.
```

Intro

Syntax

Format

Advanced

Pizza

Chapters and section depth

-1 `\part{part}`

0 `\chapter{chapter}`

1 `\section{section}`

2 `\subsection{subsection}`

3 `\subsubsection{subsubsection}`

4 `\paragraph{paragraph}`

5 `\subparagraph{subparagraph}`

Note that `\part` and `\chapter` are only available in *report* and *book* classes

Intro


Syntax

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Types of Documents

article	For articles in scientific journals, presentations, short reports, program documentation, invitations, ...
IEEEtran	For articles with the IEEE Transactions format.
proc	A class for proceedings based on the article class.
report	For longer reports containing several chapters, small books, thesis, ...
book	For real books.
slides	For slides. The class uses big sans serif letters.
memoir	For changing sensibly the output of the document. It is based on the book class, but you can create any kind of document with it [1] 
letter	For writing letters.
beamer	For writing presentations (see LaTeX/Presentations).

Document Class options

<code>10pt, 11pt, 12pt</code>	Sets the size of the main font in the document. If no option is specified, 10pt is assumed.
<code>a4paper, letterpaper,...</code>	Defines the paper size. The default size is <code>letterpaper</code> ; However, many European distributions of TeX now come pre-set for A4, not Letter, and this is also true of all distributions of pdfLaTeX. Besides that, <code>aspaper</code> , <code>b5paper</code> , <code>executivepaper</code> , and <code>legalpaper</code> can be specified.
<code>fleqn</code>	Typesets displayed formulas left-aligned instead of centered.
<code>leqno</code>	Places the numbering of formulas on the left hand side instead of the right.
<code>titlepage, notitlepage</code>	Specifies whether a new page should be started after the document title or not. The article class does not start a new page by default, while report and book do.
<code>twocolumn</code>	Instructs LaTeX to typeset the document in two columns instead of one.
<code>twoside, oneside</code>	Specifies whether double or single sided output should be generated. The classes <code>article</code> and <code>report</code> are single sided and the <code>book</code> class is double sided by default. Note that this option concerns the style of the document only. The option <code>twoside</code> does not tell the printer you use that it should actually make a two-sided printout.
<code>landscape</code>	Changes the layout of the document to print in landscape mode.
<code>openright, openany</code>	Makes chapters begin either only on right hand pages or on the next page available. This does not work with the <code>article</code> class, as it does not know about chapters. The <code>report</code> class by default starts chapters on the next page available and the <code>book</code> class starts them on right hand pages.
<code>draft</code>	makes LaTeX indicate hyphenation and justification problems with a small square in the right-hand margin of the problem line so they can be located quickly by a human. It also suppresses the inclusion of images and shows only a frame where they would normally occur.

Creating Tables I

```
\begin{center}
\begin{tabular}{ c c c }
  cell1 & cell2 & cell3 \\
  cell4 & cell5 & cell6 \\
  cell7 & cell8 & cell9
\end{tabular}
\end{center}
```

Intro

Syntax

Format

Advanced

Pizza

Creating Tables II

```
\begin{center}
\begin{tabular}{|c|c|c|}
\hline
cell1 & cell2 & cell3 \\
cell4 & cell5 & cell6 \\
cell7 & cell8 & cell9
\hline
\end{tabular}
\end{center}
```

Intro

Syntax

Format

Advanced

Pizza

Creating Tables III

```
\caption{Table to test  
captions and labels}  
\label{table:data}
```

Intro

Syntax

Format

Advanced

Pizza

Lists - unordered

Things to do on my CSSE2310 assignment:

```
\begin{itemize}
  \item write code
  \item debug code
  \item cry because I didn't properly learn
  gdb and valgrind \& stackoverflow isn't
  helping
\end{itemize}
```

Intro

Syntax

Format

Advanced

Pizza

Lists - ordered

Expectations of me showing off Latex skills:

```
\begin{enumerate}
  \item Friends: "Much wow!" :surprised:
  \item Grills: "You're awesome!":awed:
\end{enumerate}
```

Intro

Syntax

Format

Advanced

Pizza

Table of Contents (for LaTeX)

```
\maketitle
```

```
\tableofcontents
```

```
\section{Introduction}
```

Intro

Syntax

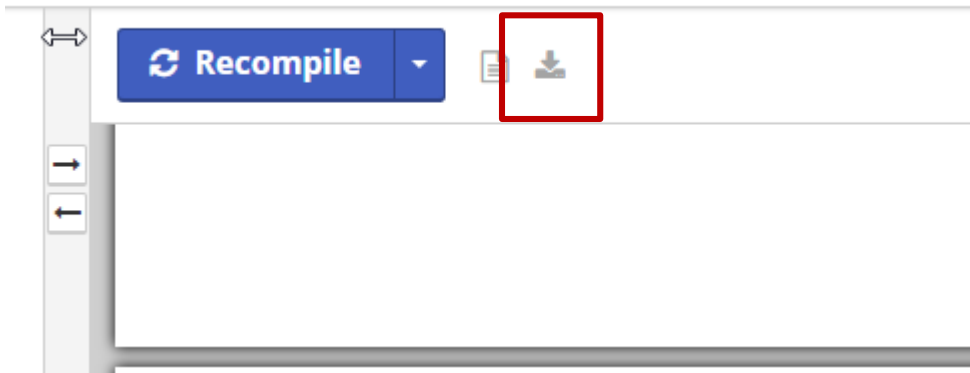
Format

Advanced

Pizza

PDA, PDEs and PDFs

- Exporting result





Advanced

- amsmath, mathtools, amsthm, amssymb – math symbols & tools packages
- biblatex – bibliography package
- babel – languages package

Intro

Syntax

Format

Advanced

Pizza



Maths packages II

$$W = \frac{1}{\sqrt{N}} \begin{bmatrix} 1 & 1 & 1 & 1 & \dots & 1 \\ 1 & \omega & \omega^2 & \omega^3 & \dots & \omega^{N-1} \\ 1 & \omega^2 & \omega^4 & \omega^6 & \dots & \omega^{2(N-1)} \\ 1 & \omega^3 & \omega^6 & \omega^9 & \dots & \omega^{3(N-1)} \\ \vdots & \vdots & \vdots & \vdots & \ddots & \vdots \\ 1 & \omega^{N-1} & \omega^{2(N-1)} & \omega^{3(N-1)} & \dots & \omega^{(N-1)^2} \end{bmatrix}$$

Intro

Syntax

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Advanced

Pizza

Maths packages III

```
\begin{document}
\begin{lemma}
When I pull out my \LaTeX{} skills, I can woo anyone because I have game.
\end{lemma}

\begin{proof}
\begin{align*}
9x-7i &> 3(3x-7u)\\
9x-7i &> 9x - 21u\\
-7i &> -21u\\
i &\quad <3 \quad u
\end{align*}
$\therefore$ \text{ I have game.}
\end{proof}

\end{document}
```

Intro

Syntax

Format

Advanced

Pizza

Maths packages IV

Lemma 0.1. *When I pull out my \LaTeX skills, I can woo anyone because I have game.*

Proof.

$$9x - 7i > 3(3x - 7u)$$

$$9x - 7i > 9x - 21u$$

$$-7i > -21u$$

$$i < 3u$$

\therefore I have game.

□

Intro

Syntax

Format

Advanced

Pizza

babel I

```
\documentclass[french]{article}  
\usepackage[utf8]{inputenc}  
\usepackage[T1]{fontenc}  
\usepackage{babel}  
\begin{document}  
  
\tableofcontents  
  
\end{document}
```

Intro

Syntax

Format

Advanced

Pizza

babel II

```
\begin{abstract}
Ceci est un bref résumé du contenu du document
écrit en français.
\end{abstract}
```



Intro

Syntax

Format

Advanced

Pizza

biblatex

```
\documentclass{abstract}  
\usepackage[style=numeric-comp]{biblatex}  
\printbibliography{<database>} % or  
% \addbibresource{<database>.<extension>}  
\begin{document}  
\cite {<some-ref>}  
\printbibliography  
\end{document}
```

Intro

Syntax

Format

Advanced

Pizza

Matlab & LaTeX I

```
x = linspace(0,3);  
y = x.^2.*sin(x);  
plot(x,y)  
line([2,2],[0,2^2*sin(2)])
```

Intro

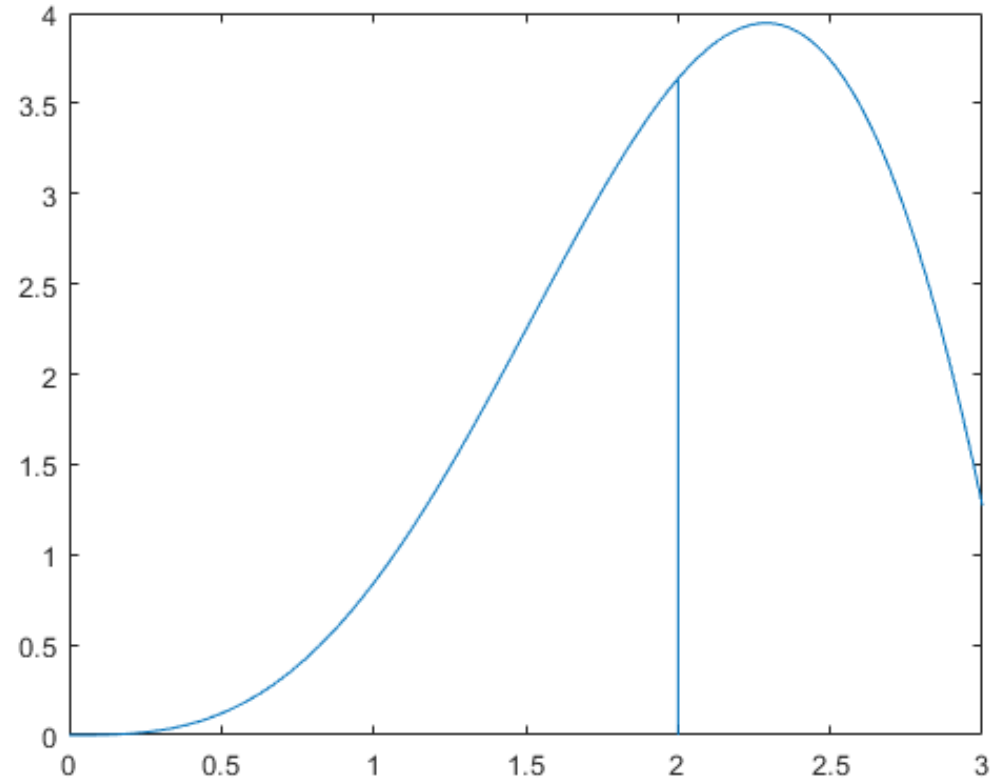
Syntax

Format

Advanced

Pizza

Matlab & LaTeX II



Intro

Syntax

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Matlab & LaTeX III

```
str = '$$ \int_{0}^{2} x^2 \sin(x) dx $$';  
text(0.25,2.5,str,'Interpreter','latex')  
annotation('arrow','X',[0.32,0.5],'Y',[0.6,0.4])
```

Intro

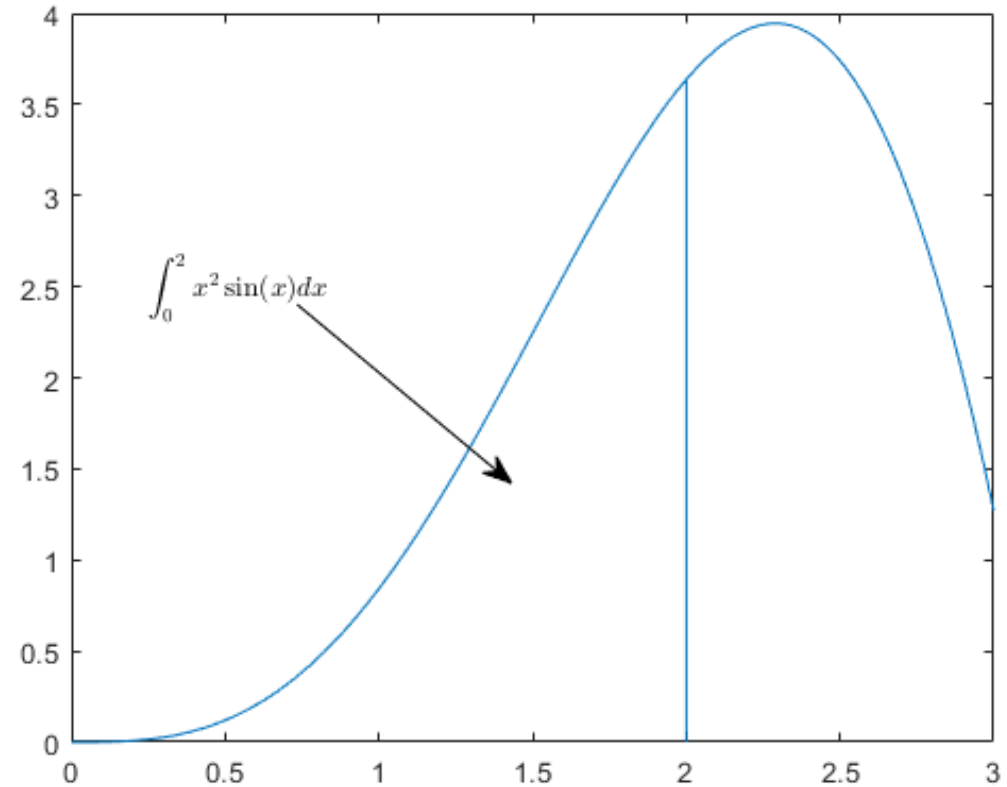
Syntax

Format

Advanced

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Matlab & LaTeX IV



Intro

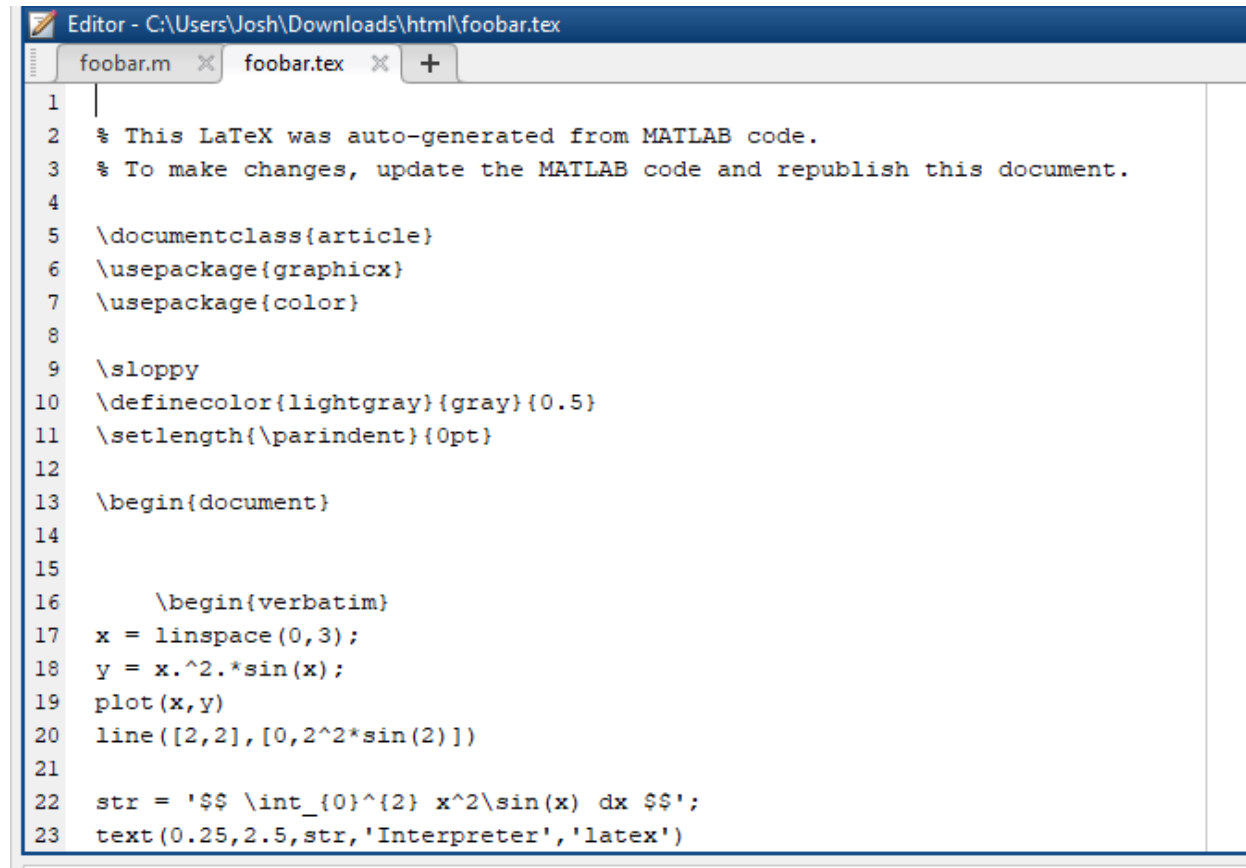
Syntax

Format

Advanced

Pizza

Matlab & LaTeX V



```
Editor - C:\Users\Josh\Downloads\html\foobar.tex
foobar.m x foobar.tex x +
1
2 % This LaTeX was auto-generated from MATLAB code.
3 % To make changes, update the MATLAB code and republish this document.
4
5 \documentclass{article}
6 \usepackage{graphicx}
7 \usepackage{color}
8
9 \sloppy
10 \definecolor{lightgray}{gray}{0.5}
11 \setlength{\parindent}{0pt}
12
13 \begin{document}
14
15
16     \begin{verbatim}
17 x = linspace(0,3);
18 y = x.^2.*sin(x);
19 plot(x,y)
20 line([2,2],[0,2^2*sin(2)])
21
22 str = '$$ \int_{0}^{2} x^2 \sin(x) dx $$';
23 text(0.25,2.5,str,'Interpreter','latex')
```

Intro

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Challenge

- Create a Thesis template:
 - <http://www.itee.uq.edu.au/thesis/submission-information> (for ITEE students)
 - <http://www.mechmining.uq.edu.au/mech-mining-thesis-submission> (for SoMME students)
- Create a report template

LaTeX Memes



badness10000/

References

- [https://www.sharelatex.com/learn/Learn LaTeX in 30 minutes](https://www.sharelatex.com/learn/Learn_LaTeX_in_30_minutes)
- <https://www.latex-project.org/about/>
- <https://tobi.oetiker.ch/lshort/lshort.pdf>
- <http://www.math.harvard.edu/texman/>
- <https://www.overleaf.com/latex/learn/free-online-introduction-to-latex-part-1#.Wp5PV-huaUk>

Quicksheets

- Maths cheat sheet:
 - <https://reu.dimacs.rutgers.edu/Symbols.pdf>
- General cheat sheet
 - https://people.cs.umass.edu/~freedman/resources/Freedman_LaTeXCheatSheet.pdf