LEARN TO LATEX

A typesetting adventure

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11 March 2019

A LITTLE BIT OF ME

- BASKETBALL
- ELEC/MATHS
- CSE
- SEN
- ENGG4900
- FOOD

STRUCTURE OF NIGHT

1. MOTIVATION
2. SYNTAX BASICS
3. SOME EXERCISES
4. ADVANCED TIPS AND TRICKS
5. WRAP-UP

Lah-Tek

SECTION 1

MOTIVATION

WHAT IT IS

- **DOCUMENT PREPARATION**

  Think Microsoft Word

- **TYPESETTING**

  Think HTML

- **USED BY SCIENTISTS AND ENGINEERS**

- **FREE SOFTWARE LICENSE**

  latex-project.org/lppl.txt

- **INVOLVES CODE AND COMPILE**

- **A LEARNING CURVE**

  Not intuitive

COMPATIBILITY

LATEX

WORD

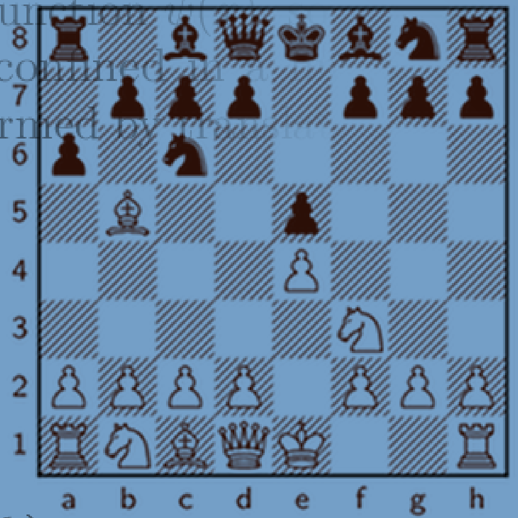
R MARKDOWN

MATLAB

WEB

$$Zn^{2+} \underset{+2\,H^+}{\overset{+2\,OH^-}{\rightleftharpoons}} \underset{\text{amphoteres Hydroxid}}{Zn(OH)_2\downarrow} \underset{+2\,H^+}{\overset{+2\,OH^-}{\rightleftharpoons}} \underset{\text{Hydroxozikat}}{[Zn(OH)_4]^{2-}}$$

1 e4 e5 2 ♘f3 ♘c6 3 ♗b5 a6



A family of wavelets can be constructed from a function $\psi(x)$, sometimes known as a "mother wavelet," which is confined in a finite interval. "Daughter wavelets" $\psi^{a,b}(x)$ are then formed by translation (b) and contraction (a).

An individual wavelet can be defined by

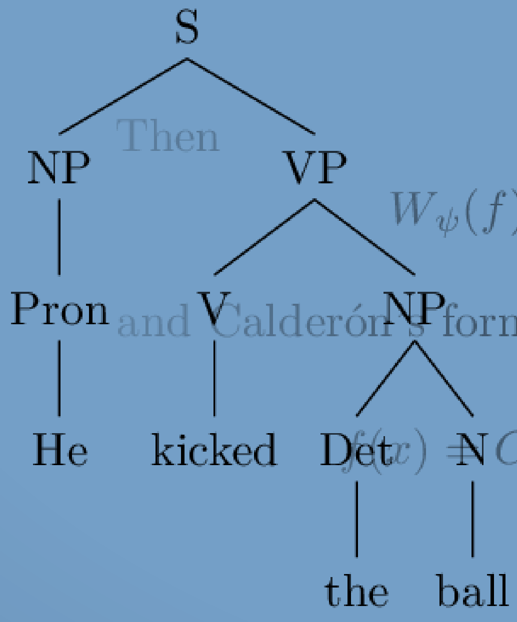
$$\psi^{a,b}(x) = |a|^{-\frac{1}{2}}\psi\left(\frac{x-b}{a}\right).$$

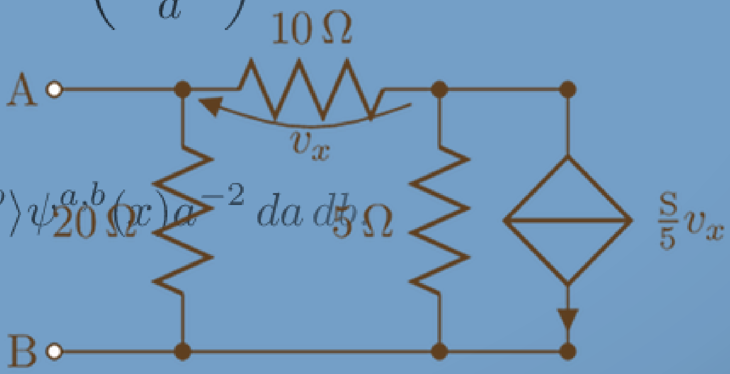
Then

$$W_\psi(f)(a,b) = \frac{1}{\sqrt{a}}\int_{-\infty}^{\infty} f(t)\psi\left(\frac{t-b}{a}\right)dt,$$

and Calderón's formula gives

$$f(x) = C_\psi \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} \langle f, \psi^{a,b}\rangle \psi^{a,b}(x)\, a^{-2}\, da\, db.$$





SOURCE: HTTP://LIANTZE.PENGUINATTACK.ORG/TRAINING_CONSULTANCY.HTML

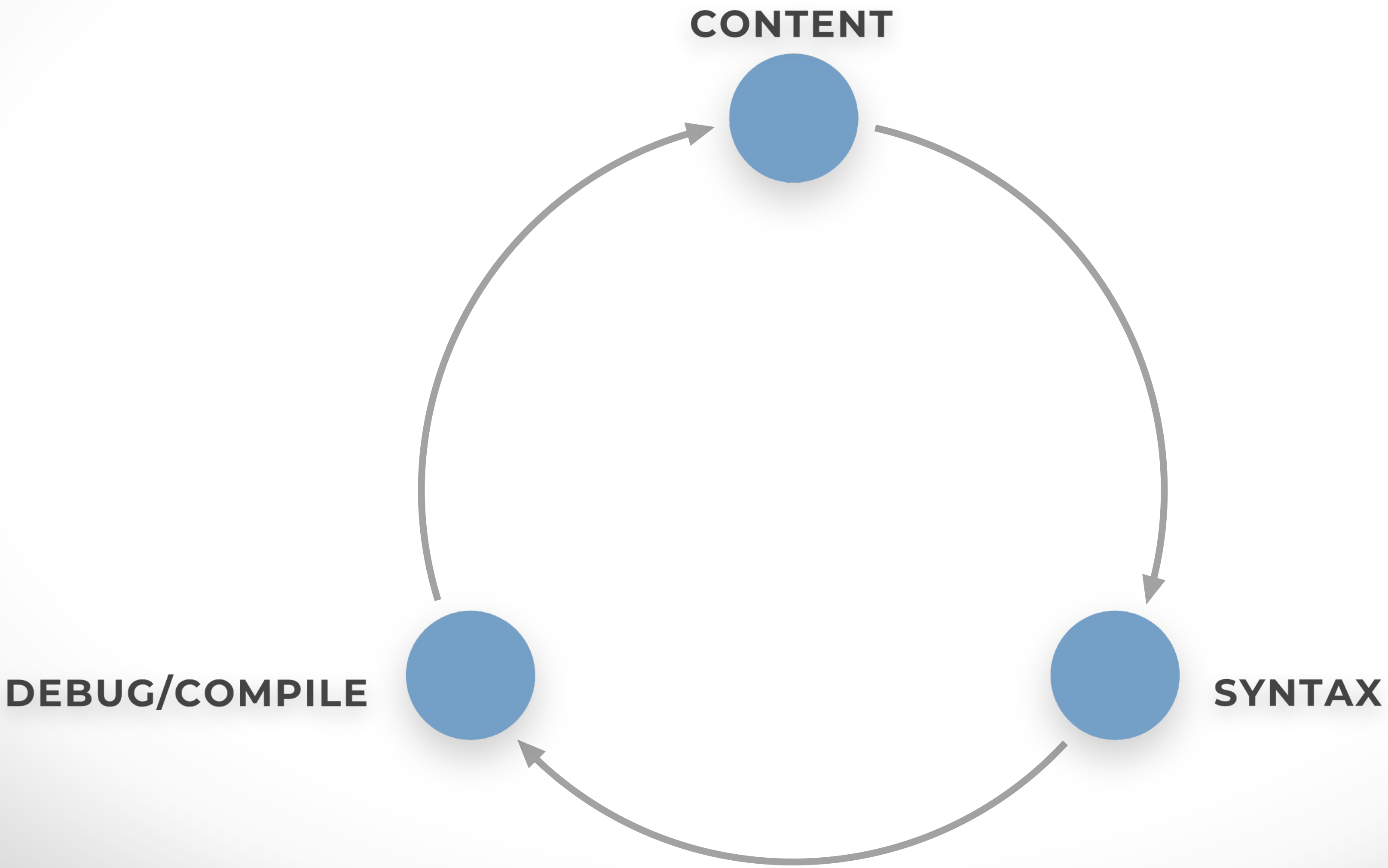
SECTION 2

SYNTAX BASICS

DOWNLOAD TEX OR USE ONLINE

1. OVERLEAF
2. NATIVE IDES

BASIC WORKFLOW



SKILLS WE LEARN

1. ## HOW TO START

   Debugging, compiling, basic principles of a LaTeX document

2. ## INTRO TO SYNTAX

   Format, structure, maths, referencing

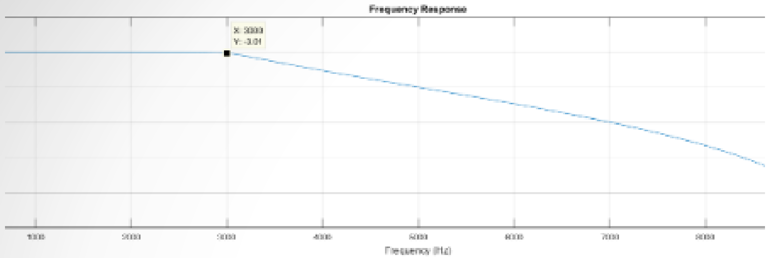
SECTION 3

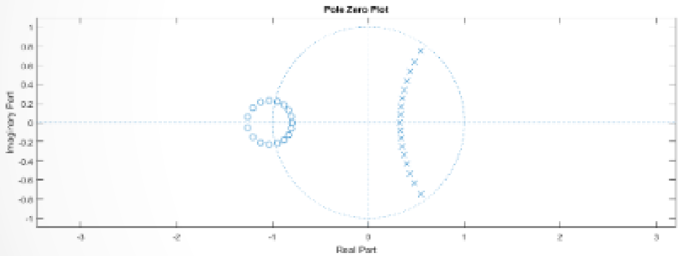
SOME EXERCISES

SECTION 4

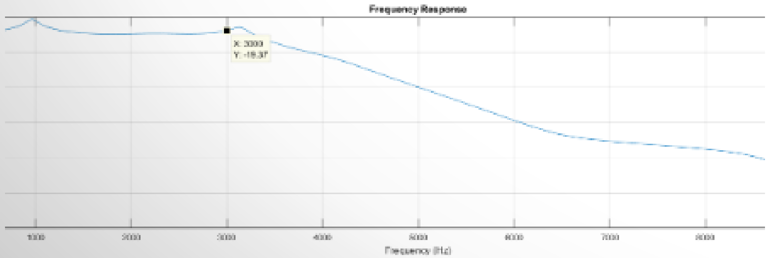
ADVANCED TIPS AND TRICKS

SOME OF MY PREVIOUS WORK





ation, the following plots are obtained:



MATLAB PLOTS

ote the change in the frequency response of the two. At the quantized filter, the stopb much more significant, the roll-off is flatter, the stopband widens and the attenuation owerful (-150 dB as opposed to -400 dB). Furthermore, the pole-zero plot analysis c ethods show that significant quantisation error is present. The positioning of the quant d zeros significantly differ to that of the original's. Despite the poles still being insid rcle and only limited to complex numbers with positive reals, the inaccuracies are caus anges in the coefficients due to quantisation. Some zeros which lie on the unit circle ha dip in the stopband.

he code for the Matlab implementation is as following.

```
% Author: Joshua Tambunan
% Date: 4/10/2017
% Title: A4Q1.m - IIR Butterworth Filter

clear all; close all; clc; clf;

% Filter
n = 9;
fs = 20000;
fc = 3000;
m = 14;     % quantisation bits

% Butterworth Filter
Wn = 2*fc/fs;
[b, a] = butter(n, Wn);
```

(MATLAB) CODE

first row and the first column of the matrix are all ones (1) to represent the DC fr lter.

ransformation matrix W can be defined as a square N-by-N matrix whereby:

$$W = \left(\frac{\omega^{jk}}{\sqrt{N}}\right)_{j,k=0,\ldots,N-1}$$

uivalently

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

omplete DFT of a signal x can be defined as $X = Wx$ i.e.

$$\begin{bmatrix} X(0) \\ X(1) \\ X(2) \\ \vdots \\ X(N-1) \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 & 1 & \cdots & 1 \\ 1 & \omega & \omega^2 & \omega^3 & \cdots & \omega^{N-1} \\ 1 & \omega^2 & \omega^4 & \omega^6 & \cdots & \omega^{2(N-1)} \\ \vdots & \vdots & \vdots & \vdots & \ddots & \vdots \\ 1 & \omega^{N-1} & \omega^{2(N-1)} & \omega^{3(N-1)} & \cdots & \omega^{(N-1)^2} \end{bmatrix} \begin{bmatrix} f(0) \\ f(1) \\ f(2) \\ \vdots \\ f(N-1) \end{bmatrix}$$

the normalisation factor of $\frac{1}{\sqrt{N}}$ is used to make the resulting DFT matrix unit nal. The vector coefficients of X measures the how strong a signal is at a fractiona

MATHS, BEAUTIFUL MATHS

SECTION 5

WRAP-UP

CHALLENGE FOR YOU

- **CREATE A THESIS TEMPLATE**

  for ITEE or for SoMME students

- **CREATE A REPORT TEMPLATE**

  Pick your favourite subject! ELEC4630, METR4201, etc.

REFERENCES

- LEARN LATEX IN 30 MINUTES
- ABOUT LATEX
- LATEX IN 139 MINS
- HARVARD'S INTRO TO TEX
- OVERLEAF'S TEX HANDBOOK

CHEAT SHEETS

- MATHS CHEAT SHEET
- GENERAL CHEAT SHEET