VNVe
Computer lab 01

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Introduction

- Hi, welcome to the computer laboratory
- Open: https://www.fit.vutbr.cz/study/courses/VNVe/private/
- What are we going to do today?
  - Introduction to LaTeX
  - Introduction to TKSL/FOS
  - Simple example

- Do you know LaTeX?
- I hope so, however, we'll manage either way…
- Download the project template

https://www.fit.vutbr.cz/study/courses/VNVe/private/_laboratories/2020/FinalProject.zip

- Unzip it on your P: drive

- Windows
  - MikTex distribution (next slide)
- Linux
  - Use the package manager of your distribution, installed on the computers here
  - To create the output from the `*.tex` file, navigate to the folder with the file, and type

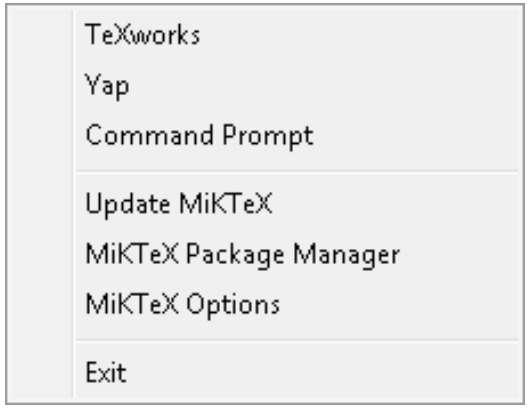
```
pdflatex name_of_file.tex
```

  - Creates a `name_of_file.pdf`
- **Online (you should probaly use this)**
  - **Overleaf**, etc.

- Download the **MikTeX Portable LaTeX distribution**

`http://miktex.org/portable`

- Extract the 7-Zip Archive to any folder on your P drive (let's say **`Latex`**)
- Run the **`miktex-portable`** script file from the **`Latex`** folder
- MikTeX icon should appear in the notification area of the taskbar (next to the clock), right click, you should see the menu like this one:



- Open the **TeXworks** application

- **Change the language** if necessary:
  - Úpravy menu (2nd from the left) -> Nastavení (the last item) -> Obecné bar (the leftmost one) -> the Interface box -> your language
  - Click on OK
- Enable **line numbers**:
  - Format->Line numbers
- Enable **syntax highlighting**
  - Format->Syntax Coloring -> LaTex

- Now, open the **`01.tex`**. Select **`pdfLaTeX`** from the dropdown menu that's next to the green arrow and then click on the green arrow
- If everything works as it should, you should see the generated PDF on the right in the few seconds

- All right, let's check the source code and see why our PDF looks the way it looks
- Just to get it out of the way, the more comprehensive information can be found at http://en.wikibooks.org/wiki/LaTeX, you have this address in the `.tex` file in the comments

You can see, that the source code of our PDF is nothing scary, so let's go through it:

- **`\documentclass[a4paper,12pt]{article}`**
  - The document class specifies the basic parameters of your document. We can see, that this is document is going to be set on the **A4** paper with font of size 12pt, and the type of the document is going to be **`article`**
- **`\usepackage[options]{name of the package}`**
  - These lines specify the packages the document uses. The provided example uses English localization support and images support

- **`author{}, \date{}, \title{}`**
  - Title page content, **`\today`** means today's date (the date of the "typesetting")
- **`\begin{document}`**
  - The beginning of the document environment. Everything you want the reader to see is going to go here before the **`\end{document}`**
- **`\section{Section name}`**
  - Our document is split into several sections (articles have sections, books have chapters…)
- **`\includegraphics[width=5cm,keepaspectratio]{im}`**
  - This includes the image **`im`** and sets it's width to 5cm and keeps the aspect ratio of the resulting image

- Software, that allows us to solve systems of ordinary differential equations using the highly accurate numerical method
- TKSL
  - Old, not very well supported on the modern PCs
  - Information after the end of the presentation for those interested
- **FOS**
  - Available online
  - Syntax like C/C++
  - Under active development
  - Documented

- http://www.fit.vutbr.cz/~iveigend/fos
  - Switch the language to English
- Similar syntax to C language
  - Sections
    - Setup (contains computation settings, constant definition)
    - Graph, Video (output setup)

- Constants can't change their values during computation
  - **`tmax`** – maximum time for computation (currently 1)
  - **`dt`** – integration step (0.1)
    - We get the result in every integration step. We start with the step 0 (initial condition).
    - **Number of steps = `tmax/dt`** (we assume constant step size at the moment)
  - **`eps`** – precision of the calculation (1e-20)
    - Basically how many Taylor series terms are calculated during every integration step
    - Bigger the precision the more terms we need and vice versa
    - We call the number of Taylor's series terms used during the integration step the **ORDER**

FOS – first example

- Look at the following expression

$$y = y_0 * e^{at}$$

- How does the first derivative look like?

FOS – first example

- Look at the following expression

$$y = y_0 * e^{at}$$

- How does the first derivative look like?

$$y' = y_0 * a * e^{at} = \mathrm{a} * \mathrm{y}$$

With y_0 being an initial condition

$$y' = \mathrm{a} * \mathrm{y} \quad \mathrm{y}(0) = \mathrm{y}_0$$

- Can you draw it using the block algebra?

- What changes with positive or negative a

Thank You For Your Attention !

- Before we begin, copy the Dosbox folder from the **Q** drive to your **P** drive and make the following changes in the **`dosbox.conf` (DosBox Configuration)** file:

```
[cpu]
cycles=max

or
CTRL+F12
```

- Download:

1) The **TKSL/386** simulation language:
www.fit.vutbr.cz/~kunovsky/TKSL/down/tksl386.zip

2) The **experiment file**:
www.fit.vutbr.cz/~iveigend/pages/vnve/01.zip

- Extract the TKSL into some directory on your P drive (let's say TKSL)
- Extract the zip file **`01.zip`** and copy the experiment file (**`01.INP`**) into the TKSL folder that is on your P drive
- Run DosBox and start TKSL by typing the following into the command prompt: (ENTER after every line):

```
cd your_TKSL_folder
tr.bat
```

- You should now see the TKSL/386 interface ☺