

MATH 441 — NOTES ON LATEX VIA OVERLEAF

Getting started.

- (1) Open Overleaf: <https://www.overleaf.com/>
- (2) Register with email and password, or login if you already have an account.
- (3) Create a new project (Green button, upper left, “New Project”). Choose “Example Project”. Name it “Homework ___, Class. _____” (here put 9am or 11am as appropriate).
- (4) You will type everything on the left and see your results on the right.
- (5) Put your name in `\author{_____}` and the due date in `\date{_____}`. (Author should already be populated by your username or email, please change this to be your name instead.)
- (6) Add the command `\usepackage{amsmath}`, which provides additional mathematical commands (user guide: <https://ctan.org/pkg/amsmath?lang=en>)

Putting material in your file.

- (1) The contents of your document will go between `\begin{document}` and `\end{document}`.
- (2) You can use commands like `\section{_____}`, `\subsection{_____}`, `\subsubsection{_____}`, etc, to give titles to sections and have the titles show up in a header font.
- (3) For lists you can use commands like

```
\begin{enumerate}
\item This is the first item
\item This is the second item
\end{enumerate}
```

to get:

- (a) This is the first item
- (b) This is the second item

- (4) Or type

```
\begin{itemize}
\item This is an item
\item This is another item
\end{itemize}
```

to get a bullet list:

- This is an item
- This is another item

- (5) You will also want to typeset mathematical symbols: the code `$f(x)=\sin(x)+\alpha$` gives you $f(x) = \sin(x) + \alpha$, while

```
\begin{equation}f(x)=\sin(x)+\alpha\end{equation}
```

gives you a displayed formula

$$(1) \quad f(x) = \sin(x) + \alpha$$

- (6) If you want to include a figure, do it like they do in the example file. In that case, universe.jpg was added to your files on the left. If you were adding your own image, you’d need to upload it there using the little line with the up-arrow which says “Upload” when you hover your mouse over it.
 - Note: if you need to save a direction field plot from the Bluffton online plotter, you will notice in the lower left of the screen, it says “To save the image, right-click this thumbnail”.
 - Once you upload your figure and include it like they do in the example file, you may need to change the size.

For example:

```
\begin{figure}[h!]
\centering
\includegraphics[width=\textwidth]{filename}
\caption{Some sort of description of the figure}
\label{fig:myplot}
\end{figure}
```

The above code snippet will insert a figure called `filename.---` (many figure extensions are accepted, including png and jpg), and will make said figure have the width of the text.

(7) A useful math construct is aligned equations: the code

```
\begin{align}
y(t)
&=\frac{1}{\mu(t)}\int_{t_0}^t\mu(\tau)g(\tau)d\tau\\
&=\frac{1}{t}\int_{t_0}^t\tau(\tau+1)d\tau\\
&=\frac{1}{t}\int_{t_0}^t(\tau^2+\tau)d\tau\\
&=\frac{1}{t}\left[\frac{1}{3}\tau^3+\frac{1}{2}\tau^2+C\right]
&=\frac{1}{3}t^2+\frac{1}{2}t+\frac{C}{t}
\end{align}
```

results in:

$$(2) \quad y(t) = \frac{1}{\mu(t)} \int_{t_0}^t \mu(\tau)g(\tau)d\tau$$

$$(3) \quad = \frac{1}{t} \int_{t_0}^t \tau(\tau + 1)d\tau$$

$$(4) \quad = \frac{1}{t} \int_{t_0}^t \tau^2 + \tau d\tau$$

$$(5) \quad = \frac{1}{t} \left[\frac{1}{3}t^3 + \frac{1}{2}t^2 + C \right]$$

$$(6) \quad = \frac{1}{3}t^2 + \frac{1}{2}t + \frac{C}{t}$$

Notes on the code:

- `&` tells LaTeX where to line up the formulas.
- `\\` tells LaTeX to start a new line (not needed at the end of the final line before `\end{align}`).
- to get proper spacing before the differential $d\tau$, you could insert a small space: `\, d\tau`
- if you do not want the equations numbered, then use `\begin{align*}` and `\end{align*}`

Debugging tips. Common errors include:

- missing $\$$ signs (remember math mode starts with $\$$ and ends with $\$$)
- missing alignment symbols (each line should have one, in the align environment)
- missing end-line commands `\\` in the align environment

Where to learn more. Look for tutorials online, such as the tips on “Typing math” from Professor Hildebrand:

<https://faculty.math.illinois.edu/~hildebr/tex/course/>

Or search directly for your specific issue, such as “matrices in LaTeX”.

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