

# Resources for Analysis Refresher Course

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June 2024

As is usual in mathematics, **doing exercises**, is the best way to learn and understand material. Students are encouraged to attempt exercises from the textbooks/lecture notes/exercise sheets referenced below. All the mentioned resources from this document can be found and download in the OneDrive folder: Refresher in Analysis - Literature<sup>1</sup>  
Password: RefresherAnalysis2024.

Disclaimer: The resources below cover much more material than there will be in the refresher course, and certain parts of the material below are not relevant to courses in the Masters programme at Luxembourg. Hence, to find the relevant parts of each of the materials below, at least for the refresher course, it is best to look at the contents of the refresher course listed below.

## Analysis refresher course contents

- Basic real analysis: functions of one variable and several variables, derivatives, inverse and implicit function theorems
- Ordinary Differential Equations: elementary solution techniques like separation of variables and variation of the constant, existence and uniqueness theorem (Picard/Lindelöf), some facts about linear ODE
- Basic complex analysis (of one variable): definition of holomorphic, power series development, identity theorem, Cauchy Riemann equations, complex path integration and use of the residue theorem for the computation of real integrals

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<sup>1</sup>[https://uniluxembourg-my.sharepoint.com/:f:/g/personal/guendalina\\_palmirotta\\_uni\\_lu/Emkxs9\\_LSLpIrrLetxXE-5IBmMdkKcuXM6M-d6cQsEjQ1A?e=Jor5GW&CT=1718021963646&OR=OWA-NT-Mail&CID=a45cde1c-8199-573b-5f36-5c8c3d312e23](https://uniluxembourg-my.sharepoint.com/:f:/g/personal/guendalina_palmirotta_uni_lu/Emkxs9_LSLpIrrLetxXE-5IBmMdkKcuXM6M-d6cQsEjQ1A?e=Jor5GW&CT=1718021963646&OR=OWA-NT-Mail&CID=a45cde1c-8199-573b-5f36-5c8c3d312e23)

## Textbooks

- *Advanced Calculus*, A Geometric View, James J. Callahan, Springer (2010).
- *Complex Analysis*, Third Edition, Undergraduate Texts in Mathematics, Joseph Bak and Donald J. Newman, Springer (2010).
- *Mathematical Analysis I*, Second Edition, Claudio Canuto and Anita Tabacco, Springer (2015).
- *Visual Complex Analysis*, Tristan Needham, Clarendon Press, Oxford (1997).
- *Understanding Analysis*, Second Edition, Undergraduate Texts in Mathematics, Stephen Abbott, Springer (2010).

## Notes freely available online

- Analysis 3 (with solutions of the exercises) by Job Kuit  
<https://math.uni-paderborn.de/ag/rg/team/kuit/analysis-3>
- Complex Analysis Lecture Notes by Dan Romik:  
<https://www.math.ucdavis.edu/~romik/data/uploads/notes/complex-analysis>
- Complex Analysis with Applications by Jacob Shapiro:  
[https://web.math.princeton.edu/~js129/PDFs/teaching/MAT330\\_spring\\_2023/MAT330\\_Lecture\\_Notes.pdf](https://web.math.princeton.edu/~js129/PDFs/teaching/MAT330_spring_2023/MAT330_Lecture_Notes.pdf)
- Ordinary Differential Equation by Alexander Grigorian:  
<https://www.math.uni-bielefeld.de/~grigor/odelec2007.pdf>

## Online (youtube) courses

Check Steve Brunton's youtube channel: <https://www.youtube.com/@Eigensteve/videos>.

- Differential Equations and Dynamical Systems by Stve Brunton:  
<https://www.youtube.com/watch?v=9fQkLQZe3u8&list=PLMrJAKhIeNNTYaOnVI3QpH7jgULnAmvPA>
- Crash Course in Complex Analysis by Steve Brunton:  
[https://www.youtube.com/watch?v=\\_mv0q7-WF4E&list=PLMrJAKhIeNNQBRs1Pb7I0yTnES981R8Cg](https://www.youtube.com/watch?v=_mv0q7-WF4E&list=PLMrJAKhIeNNQBRs1Pb7I0yTnES981R8Cg)
- Complex analysis, A Visual and Interactive Introduction by Juan Carlos Ponce Campuzano:  
<https://complex-analysis.com/>