TU Munich- MA 0000

Mathematics course

Template repo

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PREFACE

These notes and exercise solutions are based off the work that I have put in for studying for MA 0000- while attending TU Munich. Anyone is more than free to share these notes, however I cannot personally guarantee the full correctness of the notes or solutions. There are likely errors introduced into the notes (and likely by mine own mistake). If you find any errors, please do not hesitate to reach out – I am more than happy to correct the notes and distribute a revised version.

Part I

Course Notes

CHAPTER 1

EXAMPLE CHAPTER

Here is an example chapter that might have various different aspects of mathematics in it. For example, we might have a theorem that is really important and deseriving of its own section like this:

1.1 THEOREM: Example theorem

The fundamental theorem of calculus states that if $f : [a, b] \longrightarrow \mathbb{R}$ *is an integrable function, and you give the function* F *by*

$$F(x) = \int_a^x f(t)\ \mathrm{d}t$$

, then $\frac{\mathrm{d}}{\mathrm{d}x}F(x) = f(x) - f(a)$.

Outline of the proof

- Define the function F as you would like it to be.
- For each x look at a neighborhood around x and calculate the derivative using mean value theorem.
- Shrink the neighborhood until you get the result.

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Proof of the Fundamental Theorem of Calculus

Let $F(x)$ be the function as desired and fix $x \in (a, b]$. Then ...

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For more on this proof, see the Wikipedia page [1].

Part II

Exercise Sheets

EXERCISE SHEET 1

Exercise 1

Let F be a differentiable function. Prove that

$$\int_a^t \frac{\mathrm{d}}{\mathrm{d}x} F(x)\ \mathrm{d}x = F(t) - F(a)$$

Hint Use the fundamental theorem of calculus

Part III

Exercise Solutions

EXERCISE SHEET 1

Exercise 1

Let F be a differentiable function. Prove that

$$\int_a^t \frac{\mathrm{d}}{\mathrm{d}x} F(x)\ \mathrm{d}x = F(t) - F(a)$$

Solution

Using the fundamental theorem of calculus, we start off by showing that ...

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CHAPTER A

NOTATION

Throughout these notes we use the following notation conventions:

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CHAPTER B

BACKGROUND

This chapter contains some references to background material and knowledge needed for the course, but is by no means an extensive resource.

REFERENCES

[1] wiki. *The Fundamental Theorem of Calculus*. wikipedia. URL: https://en.wikipedia.org/wiki/Fundamental_theorem_of_calculus#%20Proof_of_the_first_part.