

Fantuan's Academia

FANTUAN'S MATH NOTES SERIES

Notes on Mathematical Analysis

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**NOOOO!!!!!!YOU CANT JUST
INTEGRATE A FUNCTION
WHICH FAILS THE MONOTONE
CONVERGANCE THEORINO!!!!!!
NOOO!!! YOU CANT JUST INTEGRATE
ON STRUCTURES IN NON- EUCLIDIAN
SPACE!!!!!!!!!!!! JUST NO!!!!!!
YOU CANT JUST INTEGRATE
UNBOUNDED INTEGRALS
WITHOUT TAKING A LIMIT!!!!!!!!!!!!!!
YOU IMBECILE!!!!!! YOU
ABSOLUTE FUCKING MORON!!!!!!!!!!!!**



haha Lebesgue integral go brrrrr

$$\int_E f d\mu = \int_E f(x) d\mu(x)$$

for measurable real-valued functions f defined on E .

$$\int_E f d\mu = \sup \left\{ \int_E s d\mu : 0 \leq s \leq f, s \text{ simple} \right\}$$

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All the Sections with * are hard sections and can be skipped without losing coherence.

This note is referenced on **Introduction to Real Analysis** by Christopher Heil [3], **Real Analysis: Modern Techniques and Applications** by Folland [2], **Real Analysis** by Stein [4], **Measure, Integration and Real Analysis** by Sheldon Axler[1] (the famous ‘Linear Algebra Done Right’ Author!), and **Real and Complex Analysis** by Walter Rudin[5].

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Part I

PART I: Measure and Integration

Chapter 1

Lebesgue Measure

1.1 Why Real Analysis?

What is this note about if we already have the introductory mathematical analysis? The main reason is that **Riemann Integral** has many deficiencies so that we need a more rigorous approach to the integration theory to solve these problems.

1.2 Exterior Measure

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Bibliography

- [1] Axler, S. (2020). *Measure, integration & real analysis*. Springer Nature.
- [2] Folland, G. B. (1999). *Real analysis: modern techniques and their applications*, volume 40. John Wiley & Sons.
- [3] Heil, C. (2019). *Introduction to real analysis*, volume 280. Springer.
- [4] Stein, E. M. and Shakarchi, R. (2009). *Real analysis: measure theory, integration, and Hilbert spaces*. Princeton University Press.
- [5] Walter, R. (1987). *Real and complex analysis*.