### 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

$$\int_{E}f\,d\mu=\int_{E}f\left( x
ight) \,d\mu\left( x
ight)$$

for measurable real-valued functions f defined on E.

$$\int_E f \, d\mu = \sup igg\{ \int_E s \, d\mu : 0 \le s \le f, \; s ext{ simple} igg\}$$

Failthair S Malin Hotel

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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

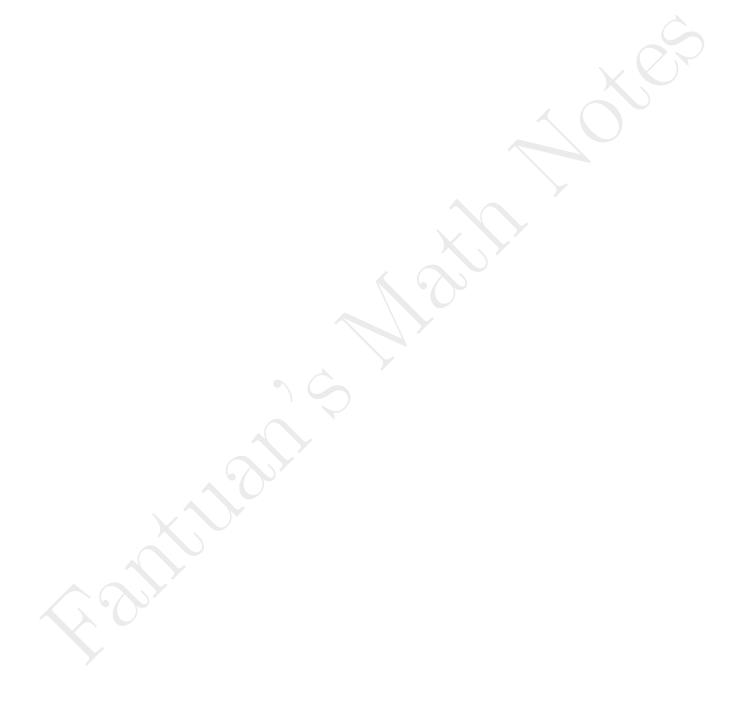
## Chapter 1

# 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



# **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.