



# Numerical Integration

Numerical Introductory Course  
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# 1. Abstract

# 1. Introduction

# 1. Motivation

Integration is an important operation in mathematics. Unfortunately, in real life applications one might find it extremely difficult or even impossible to solve certain integrals. Due to the continuous improvement in computational power one might address this issue by numerically approximating the integral of interest. In order to do so, several procedures have been developed, each with its own pros and cons. One may for example use the “Rechteckapproximation”, the “Trapezapproximation” or the in this paper elaborated on Monte Carlo Method.

## 2. Literature Review

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## 3. Theory

In the following section I want to explain some of the most popular methods in numerical integration. These can be distinguished into one and multi-dimensional methods. Furthermore one might distinguish numerical integration methods further into deterministic and probabilistic methods.

### 3.1 Review: The Riemann Integral

### 3.2 One-Dimensional Procedures

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### 3.3 Multi-Dimensional Procedures

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### 3.4 Integrals over infinite Intervals

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## 4. Application: Approximation of the Normal Distribution

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## 5. Conclusion

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## 6. Bibliography

(“Monte-Carlo-Integration”)

“Monte-Carlo-Integration.” <https://www.mathematik.tu-clausthal.de/interaktiv/integration/montecarlo/>.