

Calculus

Welcome to the Wikibook of

Calculus

This wikibook aims to be a high quality **calculus** textbook through which users can master the discipline. Standard topics such as *limits*, *differentiation* and *integration* are covered, as well as several others. Please contribute wherever you feel the need. You can simply help by rating individual sections of the book that you feel were inappropriately rated!

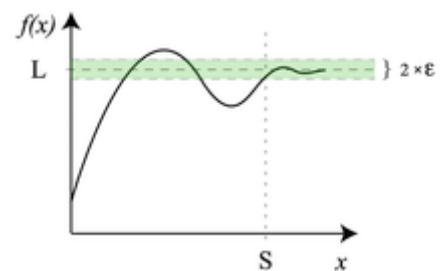
- Introduction
- Contributing

Precalculus

- 1.1 Algebra
- 1.2 Trigonometric functions
- 1.3 Functions
- 1.4 Graphing linear functions
- 1.5 Exercises

Limits

- 2.1 An Introduction to Limits
- 2.2 Finite Limits
- 2.3 Infinite Limits
- 2.4 Continuity
- 2.5 Formal Definition of the Limit
- 2.6 Proofs of Some Basic Limit Rules
- 2.7 Exercises



Differentiation

Basics of Differentiation

- 3.1 Differentiation Defined

3.2 Product and Quotient Rules

3.3 Derivatives of Trigonometric Functions

3.4 Chain Rule

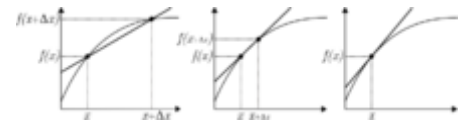
3.5 Higher Order Derivatives: an introduction to second order derivatives

3.6 Implicit Differentiation

3.7 Derivatives of Exponential and Logarithm Functions

3.8 Some Important Theorems

3.9 Exercises



Applications of Derivatives

3.10 L'Hôpital's Rule

3.11 Extrema and Points of Inflection

3.12 Newton's Method

3.13 Related Rates

3.14 Optimization

3.15 Euler's Method

3.16 Exercises

Integration

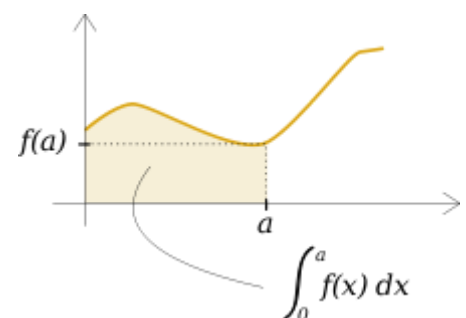
Basics of Integration

4.1 Definite integral

4.2 Fundamental Theorem of Calculus

4.3 Indefinite integral

4.4 Improper Integrals



The definite integral of a function $f(x)$ from $x=0$ to $x=a$ is equal to the area under the curve from 0 to a .

Integration Techniques

4.5 Infinite Sums

4.6 Derivative Rules and the Substitution Rule

4.7 Integration by Parts

4.8 Trigonometric Substitutions

4.9 Trigonometric Integrals

[4.10 Rational Functions by Partial Fraction Decomposition](#)

[4.11 Tangent Half Angle Substitution](#)

[4.12 Reduction Formula](#)

[4.13 Irrational Functions](#)

[4.14 Numerical Approximations](#)

[4.15 Exercises](#)

Applications of Integration

[4.16 Area](#)

[4.17 Volume](#)

[4.18 Volume of solids of revolution](#)

[4.19 Arc length](#)

- [Surface area](#)
- [Work](#)
- [Centre of mass](#)
- [Pressure and force](#)
- [Probability](#)

Parametric and Polar Equations

Parametric Equations

- [Introduction to Parametric Equations](#)
- [Differentiation and Parametric Equations](#)
- [Integration and Parametric Equations](#)
- [Exercises](#)

Polar Equations

- [Introduction to Polar Equations](#)
- [Differentiation and Polar Equations](#)
- [Integration and Polar Equations](#)

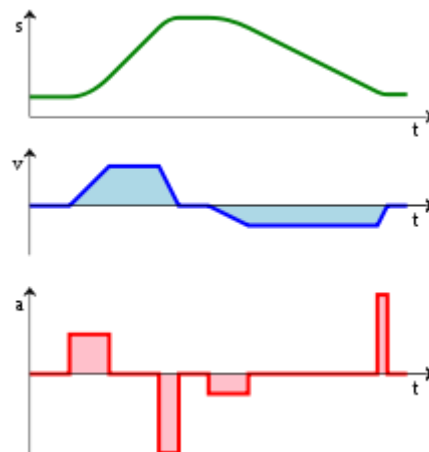
Sequences and Series

Sequences

- [Definition of a Sequence](#)
- [Sequences](#)

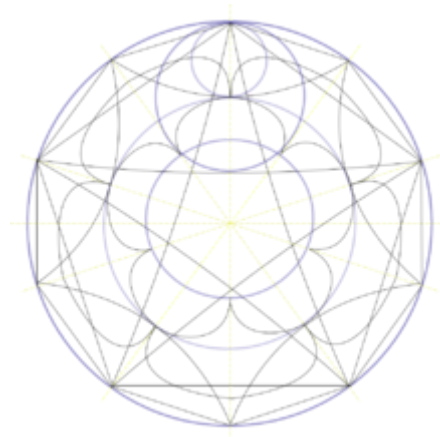
Series

- [Definition of a Series](#)



From bottom to top

- an acceleration function $a(t)$;
- the integral of the acceleration is the velocity function $v(t)$;
- and the integral of the velocity is the distance function $s(t)$.



- [Series](#)
- [Limit Test for Convergence](#)
- [Comparison Test for Convergence](#)
- [Integral Test for Convergence](#)

Series and calculus

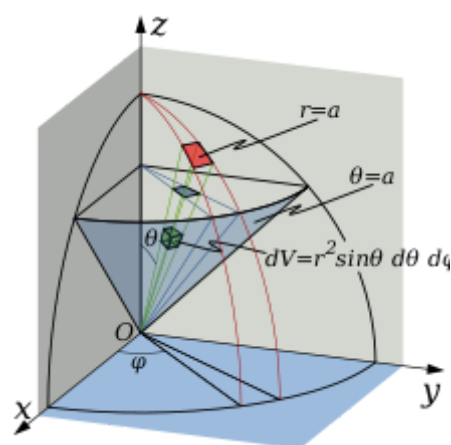
- [Taylor series](#)
- [Power series](#)

Exercises

- [Exercises](#)

Multivariable and Differential Calculus

- [Vectors](#)
- [Lines and Planes in Space](#)
- [Multivariable Calculus](#)
- [Derivatives of multivariate functions](#)
- [The chain rule and Clairaut's theorem](#)
- [Inverse function theorem, implicit function theorem](#)
- [Vector calculus](#)
- [Vector calculus identities](#)
- [Inverting vector calculus operators](#)
- [Helmholtz Decomposition Theorem](#)
- [Discrete analog to Vector calculus](#)
- [Exercises](#)



Differential Equations

- [Ordinary Differential Equations](#)
- [Partial Differential Equations](#)

Extensions

Advanced Integration Techniques

- [Complexifying](#)

Further Analysis

- [Systems of Ordinary Differential Equations](#)

Formal Theory of Calculus

- [Real numbers](#)
- [Complex numbers](#)

References

- [Table of Trigonometry](#)
- [Summation notation](#)
- [Tables of Derivatives](#)
- [Tables of Integrals](#)

Acknowledgements and Further Reading

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