

# Calculus in One Variable 1

Programme course

6 credits

Envariabelanalys 1

TATA41

Valid from: 2017 Spring semester

**Determined by**

Board of Studies for Electrical  
Engineering, Physics and Mathematics

**Date determined**

2017-01-25

## Main field of study

Mathematics, Applied Mathematics

## Course level

First cycle

## Advancement level

G1X

## Course offered for

- Industrial Engineering and Management - International, M Sc in Engineering
- Industrial Engineering and Management, M Sc in Engineering
- Biomedical Engineering, M Sc in Engineering
- Applied Physics and Electrical Engineering - International, M Sc in Engineering
- Applied Physics and Electrical Engineering, M Sc in Engineering
- Physics and Nanoscience, Bachelor's Programme
- Mathematics, Bachelor's Programme
- Computer Science and Software Engineering, M Sc in Engineering
- Computer Science and Engineering, M Sc in Engineering
- Design and Product Development, M Sc in Engineering
- Energy-Environment-Management M Sc in Engineering
- Information Technology, M Sc in Engineering
- Chemical Biology, M Sc in Engineering
- Mechanical Engineering, M Sc in Engineering
- Engineering Biology, M Sc in Engineering

## Entry requirements

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

## Prerequisites

Foundation Course in Mathematics

## Intended learning outcomes

To give basic proficiency in mathematical concepts, reasoning and relations contained in single-variable calculus. To provide the skills in calculus and problem solving required for subsequent studies. After a completed course, the student should be able to

- read and interpret mathematical text
- quote and explain definitions of concepts like local extremum, limit, continuity, derivative, antiderivative and integral
- quote, explain and use central theorems such as the first and second fundamental theorem of calculus, the mean value theorems, the intermediate value theorem, the extreme value theorem
- use rules for limits, derivatives, antiderivatives and integrals
- carry out examinations of functions, e.g., using derivatives, limits and the properties of the elementary functions, and by that means draw conclusions concerning the properties of functions
- use standard techniques in order to determine antiderivatives and definite integrals
- make comparisons between sums and integrals
- perform routine calculations with confidence
- carry out inspections of results and partial results, in order to verify that these are correct or reasonable.

## Course content

Functions of a real variable. Limits and continuity. Derivatives. Rules of differentiation. Derivatives of the elementary functions. Properties of differentiable functions. Derivative and monotonicity. Graph sketching, tangents and normals, asymptotes. Local and global extrema. Derivatives of higher order. How to find antiderivatives. Partial integration, the method of substitution. Antiderivatives to rational functions, functions containing certain radicals and trigonometric functions. The Riemann integral: definition and properties. Integration of continuous functions. Connection between the definite integral and antiderivatives. Methods of integration. Definition and calculation of generalised integrals. Estimation of sums.

## Teaching and working methods

Lectures and problem classes. The IT programme has a different organization, due to the study programme syllabus.

## Examination

TEN1	Written examination	6 credits	U, 3, 4, 5
------	---------------------	-----------	------------

## Grades

Four-grade scale, LiU, U, 3, 4, 5

## Department

Matematiska institutionen

## Director of Studies or equivalent

Jesper Thorén

## Examiner

Axel Hultman (Y, Yi, MED, Mat, FyN, FRIST), Magnus Herberthson (I, Ii), Hans Lundmark (D, IT,U,KB,TB) och Mikael Langer (M,DPU, EMM)

## Course website and other links

## Education components

Preliminary scheduled hours: 66 h

Recommended self-study hours: 94 h

## Course literature

### Additional literature

#### Books

Forsling, G. och Neymark, N., *Matematisk analys, en variabel* Liber

#### Other

*Problemsamling utgiven av matematiska institutionen*

## Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at [http://stydokument.liu.se/Regelsamling/Innehall/Utbildning\\_pa\\_grund-\\_och\\_avancerad\\_niva](http://stydokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva).