



SF0002 Introductory Course in Mathematics 2 3.0 credits

Förberedande kurs i matematik 2

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for SF0002 valid from Spring 2015

Grading scale

P, F

Education cycle

Pre-university level

Specific prerequisites

Completed upper secondary education including documented proficiency in Swedish corresponding to Swedish 3/Swedish B and English corresponding to English 6/English A.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

This course is the continuation of SF0001 Introductory Course in Mathematics and consists of three main parts. The sections go through some of the basic knowledge important to have fully updated for upcoming higher education studies. The course is web based and flexible, i.e. the student studies in a pace that suits him or her best.

After the course the student should be able to;

- Understand the derivative as the slope of an integral
- Understanding the derivative as the instantaneous rate of change of a physical quantity
- Know that the derivative can be characterized with f' or df/dx and that there are functions that are not derivable
- Derivate x^a , $\ln x$, e^x , $\cos x$, $\sin x$, $\tan x$ and sums/differences of such terms
- Decide the tangent and normal of an integral
- In principle derivate any elementary function
- Understand the definition of strictly increasing function, strictly decreasing function, local maximum, local minimum, global maximum, global minimum
- Decide the areas where a function is strictly increasing and decreasing by studying the derivatives character
- Decide the local maximum and minimum points and terrace point by studying the character of the derivative
- Sketch the function curve by making a character table of the derivative
- Know where the local/global maximum and minimum points occur
- Decide local maximum and minimum points character by looking at the character of the second order derivative
- Interpret integrals as area and understand other interpretations of integrals
- Decide primitive function for and decided integral of x^a , $1/x$, e^x , $\cos x$, $\sin x$ and the sum/difference of such terms
- Calculate the area under a curve and between two curves
- Know that some functions primitive functions can't be described as a analytically closed expression, e.g. e^{x^2} , $(\sin x)/x$, $\sin \sin x$
- Understand the origin of the formula for variable substitution
- Solve simpler integration problems which need rewriting and/or substitution in one step
- Describe how the integration boundaries change during variable substitution and when a variable substitution is allowed
- Understand the origin of the formula for partial integration
- Solve integration problems which need partial integration in one or two steps
- Solve integration problems which need partial integration followed by a substitution (or the other way round)
- Calculate expressions that contain complex numbers and are built up of the four rules of arithmetic
- Solve complex first degree equations
- Transform some complex numbers between the form $a+ib$ and polar form

- Calculate powers of complex numbers with de Moivre's formula
- Calculate roots of some complex numbers by rewriting them into polar form
- Solve binomial equations
- Completing the square of complex second degree expressions
- Solve complex second degree equations and factorize complex second degree expressions
- Perform polynomial division
- Understand the connection between factors and zero of polynomial
- Know that a polynomial equation of degree n has n roots (counted with multiplicity)
- Know that real polynomial equations have conjugated roots

Course contents

- **Derivatives**
Introduction, rules of differentiation, maximum and minimum problems
- **Integrals**
Introduction, variable substitution, partial integration
- **Complex numbers**
Calculations with complex numbers, polar form, exponentiation and roots, complex polynomials

Course literature

The course material will be published on the internet and is freely accessible for course participants.

Examination

- INL1 - Assignment, 3.0 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

The last day to submit assignments is September 15 and the last day to supplement submitted assignments is September 30.

Other requirements for final grade

All computer tests and assignments passed.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.