

# TMA 4115 Matematikk 3

## Introduction for MTFYMA

Alexander Schmeding

NTNU

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# Homepage

General information for the course Matematikk 3:

<https://wiki.math.ntnu.no/tma4115/2016v>

Specific information for MTFYMA:

<https://wiki.math.ntnu.no/tma4115/2016v/as>

(all slides used in the lecture will appear on this page)

At the end of the course there will be a written exam  
(further information on the homepage).

To take the exam:

Deliver **at least 8** exercise sets, which get approved.

**Note:** No exercise classes in the first week!

**Advice:** Do as many exercises as possible!

# Lecturer

Alexander Schmeding

Email: [alexander.schmeding@math.ntnu.no](mailto:alexander.schmeding@math.ntnu.no)

Office: Sentralbygg 2, Room 1202

Phone: 73593540

Office hours: Tuesday, 9-10

## Reference groups – Important!

We need 3-4 students for the reference group of this course.

At least 1 student from each line of study (i.e. mathematics and physics).

If you are interested please sign the list in the break.

## Topics of this course

- Complex Numbers
- Differential Equations I: Second Order Differential Equations
- Differential Equations II: Systems of differential equations
- Linear Algebra and Application
  - Matrices
  - Systems of linear equations
  - Vector spaces

We know the following sets of numbers:

$$\mathbb{N} = \{1, 2, 3, 4, \dots\}$$

Natural numbers

$$\mathbb{Z} = \{\dots, -3, -2, -1, 0, 1, 2, 3, 4, \dots\}$$

Integers

$$\mathbb{Q} = \left\{ \frac{m}{n} \mid m \in \mathbb{Z}, n \in \mathbb{N} \right\}$$

Rational numbers

$$\mathbb{R} = \text{Rational numbers and} \\ \text{irrational numbers (e.g. } \sqrt{2}, \pi, \dots)$$

Real Numbers

## Problem:

With all these numbers, we still can not solve the equation

$$x^2 = -1$$

since for real numbers  $x^2 \geq 0$ .

### **Solution:**

We need new numbers, the *complex numbers*.



## Why complex numbers?

- Our aim: See that complex numbers are an important tool which make things easier.

### Jacques Hadamard

The shortest path between two truths in the real domain passes through the complex domain.

- Complex does not mean complicated!