TMA 4115 Matematikk 3

Introduction for KJ & NANO

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Homepage

General information for the course Matematikk 3:

`https://wiki.math.ntnu.no/tma4115/2017v`

Specific information for KJ & NANO:

`https://wiki.math.ntnu.no/tma4115/2017v/kjnano`

(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!

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. KJ and NANO).

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

Lecturer coordinates

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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

Notation, sets of numbers

$\mathbb{N}$	$= \{1, 2, 3, 4, \ldots\}$	Natural numbers
$\mathbb{Z}$	$= \{\ldots, -3, -2, -1, 0, 1, 2, 3, 4, \ldots\}$	Integers
$\mathbb{Q}$	$= \{\frac{m}{n} \mid m \in \mathbb{Z}, n \in \mathbb{N}\}$	Rational numbers

$m \in \mathbb{Z}$ (read "m is an element of $\mathbb{Z}$") means m is a number from $\mathbb{Z}$.

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

Every natural number is an integer, we write
$\mathbb{N} \subseteq \mathbb{Z}$, (read "$\mathbb{N}$ is a subset of $\mathbb{Z}$"), "$\subseteq$" is the **subset symbol**
it means that every element of $\mathbb{N}$ is contained in $\mathbb{Z}$.
every integer is a rational number ($\mathbb{Z} \subseteq \mathbb{Q}$) and
every rational number is a real number ($\mathbb{Q} \subseteq \mathbb{R}$).

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!