

TMA4230 FUNCTIONAL ANALYSIS, WEEK 2

LAST WEEK: Last week I gave an introduction to the subject and a repetition of some topics from TMA4145 *Linear methods*, roughly corresponding to chapter 1–3 of the book.

- Introduction/repetition (Chapter 1–3).

THIS WEEK: This week we begin by taking a look at Zorn's Lemma (Section 4.1) which is a technical tool used in many areas of mathematics. We then use Zorn's Lemma to get to the first main theorem of the course, the Hahn-Banach Theorem. There are actually several versions of the Hahn-Banach Theorem so we will spend the whole week on this.

- Zorn's Lemma (Section 4.1).
- Hahn-Banach Theorem (Section 4.2–4.3).

NEXT WEEK: Next week we will use the Hahn-Banach Theorem to study *bounded linear functionals on $C[a, b]$* and introduce *the Riemann-Stieltjes integral* (Section 4.4). Something we will need later for the spectral theorem. We will then move on to *adjoint operators* (Section 4.5) and *reflexive spaces* (Section 4.6).

- The Riemann-Stieltjes integral (Section 4.4).
- Adjoint operators (Section 4.5).
- Reflexive spaces (Section 4.6).

EXERCISES FOR NEXT WEEK: 4.1.2, 4.2.3, 4.2.5, 4.2.6, 4.2.10 and 2.8.12+4.3.14.