Sheet 11: Topics for the Exam

- Banach and Hilbert spaces
  - Norms and scalar products
  - Cauchy sequences, completeness
  - Equivalent, stronger, weaker norms
  - Spaces of sequences
  - Completion of a normed vector space
  - Complete orthonormal systems

- Lebesque and Sobolev spaces
  - Definitions and dense subsets
  - Convergence theorems of Lebesgue theory, Hölder's estimate
  - Completeness
  - Distributions, weak derivatives

- Linear operators
  - Operator norms, $\mathcal{L}(X,Y)$
  - Basic principles
    (Baire, open mapping (continuous inverse), closed graph, Banach-Steinhaus)
  - Projection theorem in Hilbert spaces, continuous projections in Banach spaces
  - Theorem of Riesz, theorem of Lax-Milgram
  - Weak solutions of differential equations

- Dual spaces
  - Theorem(s) of Hahn-Banach, separations, continuation
  - Dual spaces (definition, properties, examples)
  - Adjoint maps, reflexivity

Dates:
Thu, 12.1.: No lecture at 9am (but at 1pm: questions and answers).
Tue, 17.1. and Thu, 19.1.: Repetition of exam topics (sheet 11) in the exercise classes.
Tue, 24.1. and Thu, 26.1.: Regular exercise classes (sheet 12).
Thu, 26.1.: Exam at 9am, no lecture at 1pm.
Tue, 31.1. and Thu, 2.2.: Discussion of the exam in the exercise classes.
In the following two weeks: discussion of the last two sheets 13 and 14.