Guidelines for A1 Oral Examination. January 10th 2011.

The Oral will be half an hour, and will fall into roughly three equal parts. Our aim (myself and Jose Rodrigo) will be to find out what you know, and not to give you a hard time (at least, no more than necessary).

In the first ten minutes, you should give a brief talk on the blackboard about ONE of the following topics. I would suggest choosing and summarising the relevant sections in the notes, with some rough ideas of the proofs. But exactly what you select and how you present things is up to you. (The final two 'starred' topics are much more 'woolly'; they may be more fun to think about, but will probably be harder to prepare and might require some material from outside the course to be satisfying).

- The Riesz Representation Theorem and the Lax–Milgram Lemma
- Properties of the ℓ^p sequence spaces
- Mollification
- Density of smooth functions in Sobolev spaces
- Sobolev embedding theorems
- Weak formulation of elliptic problems
- Elliptic regularity
- Eigenfunctions and eigenvalues of compact symmetric operators on Hilbert spaces
- Weak solutions of parabolic problems
- Dual spaces and weak convergence
- *Compactness and non-compactness in infinite-dimensional spaces
- *Hilbert spaces versus Banach spaces

In the second ten minutes we will ask you about a different one of these topics (not one of the final two); but in a way to complement the approach you took (depth vs details; generalities vs examples, etc.).

In the final ten minutes we will feel free to ask you about anything! But remember that our aim is to find out what you know, rather than what you don't.