## MA677 Fall 2009 Homework Problem Set #2 September 18, 2009

Assignment 2. Finish reading chapter 4 of Stein-Shakarchi on Hilbert space theory. These problems on pages 193-194 are due Friday, 2 October 2009.

- (1) Give a complete proof that a pre-Hilbert space (an inner product space) has a completion. That is, prove that there exists a Hilbert space so that the pre-Hilbert space is isometrically isomorphic with a dense subset of the Hilbert space.
- (2) Problem 9 on the construction of an ONB for  $L^2(\mathbb{R})$ .
- (3) Problem 10 on orthogonal complements.
- (4) Problem 11 on orthogonal projectors.
- (5) Problem 12. This is an extension of problem 11 in a specific setting. Make sure you prove that S is closed.