Assignments Week 1 SF2705 Fourieranalysis.

These are the things that you are expected to do before the Lecture on the **28th of January**.

1 Reading: Read the following in Stein-Shakarichi

- Chapter 1 pp. 1-23
- Chapter 2.1-2.2 pp 29-44

2 Discussion questions. Most weeks you will be given a few discussion questions. The idea of those are to force you to think about the theory. If possible, discuss them with someone or in a group. At times we will discuss some of them in the following lecture. I do not want anyone to try to memorize the theory, but rather to live with it, discuss it, try to understand the connections between the different parts of the course. The discussion questions are not part of any assessment - but being able to reflect on mathematics will help you to understand the course.

1. (Chapter 1) Why isn't the derivation of the wave equation in section 1.1 mathematically stringent?
2. (Chapter 1) Is it obvious that any function may be written as a Fourier series expansion? Is it even true?
3. (Chapter 1) Take 5-10 minutes and try to prove that for any continuous, or $C^1([0,1])$, function $f(x)$ defined on $[0,\pi]$ one can find constants A_n and B_n so that $f(x) = \lim_{N\to\infty} \sum_{n=0}^{N} (A_n \sin(nx) + B_n \cos(nx))$.

   Don't be embarrassed if you don't even know where to start. The point of the exercise is to realize that this is a difficult problem and to better be able to appreciate the theory we develop later.
4. (Chapter 2) What can be said of the Fourier series of $\frac{1}{|2x-\pi|}$?
5. (Chapter 2) What does Theorem 2.1 (p.39) say? What does it not say?
6. (Chapter 2) What makes Corollary 2.4 important?
7. (Chapter 2) Try to analyze the assumptions and conclusion in Lemma 2.4. Could you imagine any results with similar, but weaker, conclusions and weaker assumptions? Would you dare to make a conjecture.

3 Problems to consider: Solve **5, 6** and **10** in Stein-Shakarichi on pp. 26-27
Solve problem 1 on p.28 in Stein-Shakarichi.

4 Assignments: You are expected to hand in assignments every week. We will not mark all the assignments, neither will we tell you when we will mark an assignment so you should always assume that the assignment will be marked. However, since this is the first week you will not have to hand in any assignments on the 28th.

5 Office hours: I will have office hours in my office on level 7 in the mathematics building on Thursday the 23d from 1-2pm in case you have any questions.