

Assignments Week 10 SF2705 Fourieranalysis.

These are the things that you are expected to do before the Lecture on the **22nd of April**.

1 Reading: Read chapter 5.2 to 5.3, pages 149-161 in Stein-Shakarchi. I haven't decided if we will talk about the steady state Heat equation pp 149-153 or not.

2 Discussion questions.

1. It is claimed on p 155 that $\sum_{n=-\infty}^{\infty} \frac{1}{x+n}$ converges. Is the same true for $\sum_{n=-\infty}^{\infty} \frac{1}{|x+n|}$? (This is very important for Harmonic analysis: a continuation of Fourier analysis that studies properties of kernels).
2. Consider Corollary 1.5 on page 139 draw the graphs of $K_{\delta}(x)$ and $\hat{K}_{\delta}(\xi)$ for δ very small. How can you interpret the behavior of the graphs in terms of the Heisenberg uncertainty principle.
3. If $f(x) \in \mathcal{S}(\mathbb{R})$ is very smooth (by which I mean that f have small derivatives of every order), can we say that that implies anything for $\hat{f}(\xi)$ for $|\xi|$ large? Can you interpret this in terms of the Heisenberg uncertainty principle. (Ok, I know that this isn't very well defined - but there is something here worth thinking about.)

3 Problems to consider: Do **10**, **11** and **13** in Stein-Shakarchi pp. 163-164.

4. Assignment for the 22nd of April: Hand in a solution of exercise **12** on p. 164 in Stein-Shakarchi. Also prove that (i), (ii) and (iii) are necessary assumptions in Theorem 2.3 on page 148.

5 Office hours: It does not seem to be any need for office hours. In case you have any pressing question please write me an email (johnan@kth.se) and we can book a time on Friday.

6 Exam date is set: The exam will be on Wednesday the 4th of June 14:00-19:00. You will have to register for the exam using the course web "my pages" ("mina sidor") between the 14th of April (that is now - so register today) and the 4th of May. If you can not register for the exam online (most likely if you are an SU or PhD student) then you have to go to the student expedition on the first floor in this building and fill in a registration form.