

Assignments Week 13 SF2705 Fourieranalysis.

These are the things that you are expected to do before the Lecture on the **6th of May**.

1 Reading: Read chapter 6.5, pages 198-207 in Stein-Shakarchi.

2 Discussion questions.

1. Can you see that $\mathcal{R}^*\mathcal{R}(f)(x)$ is an integral over f ? This since $\mathcal{R}(f)$ is the integral of f over planes (that is an average of f on the plane) and \mathcal{R}^* again an integral. So we get that

$$\mathcal{R}^*\mathcal{R}(f)(x) = \int_{\mathbb{R}^3} \Psi(x-y)f(y)dy = \Psi * f(x),$$

for some function Ψ . Use this to conclude that if $\mathcal{R}^*\mathcal{R}(f)(x) = F(x)$ then

$$\hat{f}(\xi) = \frac{\hat{F}(\xi)}{\hat{\Psi}(\xi)},$$

if the right hand side is defined.

Can you use this to show that the operator $K_{\Psi}(f)(x) = \int_{\mathbb{R}^3} \Psi(x-y)f(y)dy$ is invertible on $\mathcal{S}(\mathbb{R}^3)$ if $\hat{\Psi}(\xi) \geq \frac{C}{1+|\xi|^k}$ and $\hat{\Psi} \in C^\infty$ (not really needed - but if we use the Fouriertransform on $\mathcal{S}(\mathbb{R}^3)$ it is needed).

2. Let $f(x) \in \mathcal{S}(\mathbb{R}^3)$. Can you find a solution formula to $\Delta u(x) = f(x)$ in \mathbb{R}^3 ? (I think that this is much more important than the Radon transform itself!)

3 Problems to consider: Do **9** and **10** in Stein-Shakarchi pp. 209-210.

4. Assignment for the 6th of May: Do assignment 11 on p. 211 in Stein-Shakarchi.

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 **This is the last week and last chance! Do it!**. 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.