

Subject: Topics in analysis I

Title: Traces

Lecturer: Serge Richard (リチャール セルジユ)

Purpose of the course: This course will provide an overview of some classical tools of functional analysis as well as some more advanced material developed over the last 10 to 15 years. After quickly recalling some basic definitions on Hilbert spaces and operators acting on them, we shall introduce many properties of the set of compact operators and the Schatten ideals. The Dixmier trace will then be introduced and compared to the usual trace. In the second part of the course, a more general framework for singular traces will be introduced, and some connections with other branches of mathematics will be presented. In particular, the link with Wodzicki's residue will be sketched. In order to provide a large panorama on the subject together with applications, some details might be omitted, but references will be provided.

Plan of the course: 1) Hilbert space and linear operators, 2) Normed ideals of $K(H)$, 3) The Dixmier trace, 4) Heat kernel and zeta-function, 5) Traces of pseudo-differential operators.

Required Knowledge: Knowledge on standard undergraduate functional analysis.

Reference: The two main references for this course will be

S. Lord, F. Sukochev, D. Zanin: Singular traces, theory and applications, 2013

B. Simon: Trace ideals and their applications, 2005 (second edition)

Attendance: This course is open for any students at Nagoya University as one of the “open subjects” of general education.

Method of Evaluation: Grades based on attendance, a written report, or an examination.

Website of this course:

<http://www.math.nagoya-u.ac.jp/~richard/Traces.html>

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