



GRADUATE LECTURES

This series of lectures aims at Master's and PhD students in mathematics and offers a first glimpse into topics which are not routinely taught in our MSc/PhD programme. The emphasis is to introduce new concepts and techniques, and not to present full mathematical details.

EXISTENCE OF NON-CONSTANT INTEGRABLE HARMONIC FUNCTIONS ON RIEMANNIAN MANIFOLDS

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A Liouville property (of harmonic functions) refers to a property of a space not admitting a non-constant harmonic function belonging to a certain class of functions. Since Liouville's discovery for a Euclidean space, various types of Liouville properties have been investigated for a Riemannian manifold. In particular, a celebrated work of Yau shows that a complete Riemannian manifold enjoys the L^p Liouville property with finite $p > 1$; however, it fails for $p = 1$. The L^1 Liouville property has remained as an important open issue in Geometric Analysis until now. In this lecture series, we first review various Liouville type properties of a Riemannian manifold and then learn that the L^1 Liouville property is closely related to long-term behaviors of Brownian motion of the manifolds. Moreover we will see how it fails and holds through a new theory and by examples. Those new results were obtained in an on-going collaborative effort by A. Grigoryan, M. Murata, and the speaker.

Date: **Mo 30.5.16 / 11:10-12:40** **Mo 06.06.16 / 11:10-12:40** **Tue 07.06.16 / 13:00-14:30**

Raum: **WIL B 321** **WIL C 129** **HSZ/403/H**