SCHEDULE WEEK 3

All times are CST

JULY 6 – JULY 10

http://math.uchicago.edu/ may/REU2021/THIRD.pdf

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Talks take place Tuesday through Friday afternoons (and/or mornings, at the discretion of speakers and hosts) Talks and group meetings are open to all participants or aimed at focus groups; for focus group events, those interested in joining and are not on the list of people in the relevant group should email the host in advance. All talks are 45 minutes to an hour, with at least a half hour break between talks. Open program talks are live on Zoom; with the speaker's permission, talks will be recorded and made available on Zoom.

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TWThF 2:30: The probability subprogram, Greg Lawler

WF 2:30: Greg Lawler

Title: Harmonic functions, Brownian motion, and analysis in the plane

Abstract: See http://math.uchicago.edu/ may/REU2021/ABSTRACTSWeek1.pdf

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Tuesday and Thursday 1:00: Shmuel Weinberger

Title: Introduction to Quantitative Topology

Abstract: The great liberating emotion of topology is its looseness, it's freedom to allow deformations, ts handling of imprecise data. So why bring analysis back in? In this series of vignettes, I will try to explain connections between quantitative topology and differential geometry, nonsmooth analysis, topological data analysis, logic, geometric group theory and maybe other things.

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Tuesday and Thursday 2:30 Seminar talks of the analysis/geometry/dynamics group begin this week; all are welcome

Tuesday 2:30 Adrian Zhu

Title: How to study the space of all surfaces in $\mathbb{R}^3$?

Abstract: We will talk about mean curvature flow, which is a geometric version of the heat equation. We will look at a lot of interesting examples, and some open problems. The talk will be very geometric.

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Wednesday and Friday 1:00: Ao Sun

Title: Heat Equations and Geometric Flows

Abstract: This will be a series of survey talks and all are welcome. The heat equation is a partial differential equation that describes how a quantity such as heat diffuses through a given region. The heat equation is connected to Fourier analysis in harmonic analysis, the study of random walks and Brownian motions in probability, the Atiyah-Singer's index theorem in geometry, and many applications in applied math. Later people found that a class of nonlinear heat equations called geometric flows are very powerful to the study of geometry and topology. One of the famous results is the solution to Poincare's conjecture using Ricci flow, by the theory of Hamilton and Perelman.

I will start with the classical linear heat equation: how to solve it and how to read geometric information of the ambient space. Then I will discuss the geometric flows, including Ricci flow and mean curvature flow. In particular, we will describe some key ideas in Perelman's proof of Poincare's conjecture.

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TWThF 4:00: Peter May (maybe a day or two of informal meetings)

Title: Historical context of stable algebraic topology

Abstract: I will begin a sequence of talks largely based on "Stable algebraic topology, 1945-1966, number [92] on my web page and a related talk "The Stone age", the first from 1999, the second from 2000. That is the starting point. While I will correlate with things already talked about, the talks will be a change of pace and as independent of everything that has come before as I can manage. Spectra were introduced with at least five different motivations in mind, both conceptual and calculational. They include cobordism, Bott periodicity and K-theory, cohomology theories in general, the Adams spectral sequence, Spanier-Whitehead and Poincaré duality, and more. Statements and motivation will have priority over detailed proofs, but a complete proof of the Brown representability theorem will be included since that has been requested. Other requests are welcome, as are any and all requests for clarification.