

MATH 497 Projects

The projects can be done individually or in groups of 2 or 3 students. You will study a topic and type a report. The project may also include computer simulations or solving problems. You are welcome to make a short presentation in class at the end of the semester.

The report should be 3-4 pages for an individual project, and longer for group projects.

You should choose a topic and let me know what you chose by *Monday, March 23*, and the final version of the report is due *Monday, April 20*.

Of course you may choose a topic and submit the report before the deadlines.

Topics:

- (1) Translations and linear flows on the torus.
(KH1) Section 5.1
- (2) Topological Markov chains – further study.
(KH2) Section 1.9, (KH1) Section 7.3.7
- (3) Homeomorphisms of the circle and rotation number.
(KH1) Section 4.3, (KH2) Chapter 11
- (4) Continued fractions, Diophantine approximation, and dynamics.
(KH1) Chapter 15
- (5) Billiards in ellipses.
- (6) Billiards in triangles and/or some other polygons.
- (7) Dynamical models in biology (Choose and study a model)
(MF)
- (8) Hausdorff dimension
(KF) Chapter 2
- (9) Mandelbrot set and Julia sets (* requires familiarity with complex functions)
(KF) Chapter 14
- (10) Propose your own project in the area of Dynamical Systems. You may study a suitable topic of your choice. A project may also include computer simulations. Please discuss the proposed topic with me.

References:

- (KH1) B. Hasselblatt and A. Katok. A First Course in Dynamics with Panorama of Recent Developments. ISBN: 978-0-5215-8750-1
- (KH2) B. Hasselblatt and A. Katok. Introduction to the Modern Theory of Dynamical Systems. ISBN-13: 978-0521341875
- (KF) K. Falconer. Fractal Geometry: Mathematical Foundations and Applications. ISBN-13: 978-0471922872 (Newer edition: ISBN-13: 978-1119942399)
- (MF) M. Farkas. Dynamical Models in Biology. ISBN-13: 978-0122491030