Syllabus for Math 689
Groups and Holomorphic Dynamics
Fall 2006

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Class hours: TR 11:10–12:25 MILN 313

MATH 689 web page: The web page of the course is
http://www.math.tamu.edu/~nekrash/teaching/06F/MATH689.html

Course Description.

The course will explore connections of group theory with holomorphic and topological dynamics and fractal
group theory. We will start from the basics of holomorphic dynamics: Julia sets, Fatou sets, theory of fixed points,
iterations of rational functions and polynomials. We will learn the general theory of self-similar groups and show
how they appear naturally in the study of iterations of self-coverings and see how self-similar groups can be used
to construct nice symbolic presentations of Julia sets and to study their topology. We will also explore the structure
of the Mandelbrot set and see how self-similar groups can be used to construct plane-filling curves.

Prerequisites are MATH 415 and MATH 446 or approval of instructor.

Outline of the course.

   Normal families. Iterations of holomorphic maps, Julia set. Local theory of fixed points. Hyperbolic and
   sub-hyperbolic maps.)

2. Self-similar groups and iterated monodromy groups. (Self-similar groups. Iterated monodromy groups.
   Contracting groups and their limit spaces. Limit spaces of iterated monodromy groups. Examples.)

3. Quadratic family. (Mandelbrot set. Iterated monodromy groups of quadratic polynomials. Kneading
   sequences and symbolic dynamics of quadratic polynomials. Mating and examples of plane-filling curves.)
Recommended texts.


Grading. Your grade will be determined by the final exam and homeworks in proportion 70:30.

Make-up policy: Make-ups for missed exams will only be allowed for a university approved excuse in writing. Wherever possible, students should inform the instructor before an exam is missed. Consistent with University Student Rules, students are required to notify an instructor by the end of the next working day after missing an exam. Otherwise, they forfeit their rights to a make-up.

Late Homeworks will not be accepted.

Scholastic dishonesty: Copying work done by others, either in-class or out of class, is an act of scholastic dishonesty and will be prosecuted to the full extent allowed by University policy. Collaboration on assignments, either in-class or out-of-class, is forbidden unless permission to do so is granted by your instructor. For more information on university policies regarding scholastic dishonesty, see University Student Rules. Remember the Aggie Code of Honor: “An Aggie does not lie, cheat, or steal or tolerate those who do.”

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