REU Projects

You may work on more than one project, or change your mind at any time and switch projects. You should pick at least one project now. Here is a summary of the possible projects with research mentors.

Alexander Ramm – Stable numerical differentiation:
The problem is to compute an estimate of the derivative of a function given bounds on the second derivative of the function and a noisy approximation to the function. Extensions of the problem will consider jump discontinuities in the function and its derivative. Part of this project will involve computer implementation of the algorithms. You should send solutions to Alex's quiz problems to him at ramm@math.ksu.edu and send him your questions about his paper 471 (now posted on our web page.)

Chris Pinner – Number theory and polynomials
Chris proposed a whold slew of problems. You should start with his hand-out on our web page.

David Yetter – Classifying small quandles
David presented the definition of a quandle. The field is wide open. You can try to define ways to build new quandles out of old quandles; try to figure out what the basic atoms for quandle theory should be (similar to the notion of a simple group); In principal computer code could be used to construct a list, but theoretical analysis is probably better.

Dima Ryabogin – Convex geometry
Dima suggested studying the relationship between the volume of a polyhedron and its dual. You could start by computing the volumes of the Platonic solids and their duals. You could move on to the semi-regular polyhedra. Alternatively, you could think about the Mahler conjecture for solids of rotation or write a computer program to compute the volume of a polyhedron and its dual.

Pietro Poggi-Corradini – The zipper method in conformal mapping
We will study a method called the "zipper" for constructing analytic one-to-one maps from bounded domains without holes to the unit disk and applications to two dimensional ideal fluid flows. The project includes familiarization with the software developed by D. Marshall at U. of Washington which implements the zipper method. Possible long-term projects deal with generalizing this method to set with holes or to write programs that will compute the lift on different types of airfoils. Interested students should start by solving the problems on the ideal flows that are included in my notes, and those given out by Dave. Let Pietro know when you need help.

Auckly and Nagy – Answer general mathematical questions and present special topics
If someone is not excited about any of the projects listed above, Dave Auckly will pose additional topics.