AACTM Schedule

BIRMINGHAM-SOUTHERN COLLEGE, 2/9/2013	**Time**	
Item	**Start**	**End**
Registration	8:15 AM	12:00 PM
Snacks	8:15 AM	9:00 AM
Welcome	9:00 AM	9:15 AM
Talks	9:15 AM	9:35 AM
Krystyna Kuperberg, Auburn *Formal mathematics as a teaching tool*		
	9:40 AM	10:00 AM
Gary Tiner, Faulkner-Montgomery *On the Erdos-Sos conjecture and graphs without a P_{k+4}*		
	10:05 AM	10:25 AM
Chadia Affane Aji, Tuskeegee *The Integration of Scilab into College Calculus*		
Break/Snacks	10:25 AM	10:50 AM
Talk	10:50 AM	11:20 AM
Hassan Fathallah-Shaykh , UAB *On the dynamics of networks*		
Lewis-Parker Lecture	11:25 AM	12:25 PM
Nandor Simanyi, UAB *Brief History of the Boltzmann-Sinai Hypothesis*		
Lunch	12:30 PM	1:30 PM
Panel Discussion	1:30 PM	2:30 PM
Andras Bezdek, Auburn Krystyna Kuperberg, Auburn Jim Gleason, UA John Mayer, UAB	*Teaching Geometry*	
Talk	2:35 PM	3:05 PM
Jerome Goddard, AUM *Where have all the fish gone? A mathematical study of diffusive population models with harvesting*		
Business Meeting	3:10 PM	3:30 PM

AACTM Abstracts

Lewis-Parker Lecture

Nandor Simanyi, UAB

Biosketch – Dr. Nandor Simanyi received his doctoral degree from Roland Eotvos University, Budapest, in 1987, and his subsequent scientific degrees (C. Sc. and D. Sc.; i. e., Candidate of Sciences and Doctor of Sciences) from the Hungarian Academy of Sciences in 1989 and 1995. He works primarily in the theory of non-uniformly hyperbolic dynamical systems. During the 1980s and 1990s he worked as a research professor for the Alfred Renyi Mathematical Institute (Budapest), and as a professor at the University of Szeged, while visiting several universities in the United States. He has been a faculty member in the Department of Mathematics at UAB since 1999. Outside interests include hiking and enjoying classical music.

Brief History of the Boltzmann-Sinai Hypothesis

Abstract. The Boltzmann-Sinai Hypothesis dates back to 1963 as Sinai's modern formulation of Ludwig Boltzmann's statistical hypothesis in physics, actually as a conjecture: Every hard ball system on a flat torus is (completely hyperbolic and) ergodic (i. e. "chaotic", by using a nowadays fashionable, but a bit profane language) after fixing the values of the obviously invariant kinetic quantities.
In the half century since its inception quite a few people have worked on this conjecture, made substantial steps in the proof, created useful concepts and technical tools, or proved the conjecture in some special cases, sometimes under natural assumptions. Quite recently I was able to complete this project by putting the last, missing piece of the puzzle to its place, getting the result in full generality.
In the talk I plan to present the brief history of the proof by sketching the most important concepts and technical tools that the proof required.

Geometry Panel

Jim Gleason (UA) – Our Geometry for Teachers course is a blend of improving students high school geometry knowledge through the use of ALEKS software and the connections between high school mathematics and upper division mathematics through a focus on transformations of the plane represented by R^2 and C including connections to group theory, complex calculus, and trigonometry.

Krystyna Kuperberg and Andras Bezdek (Auburn) – The geometry of objects in three dimensional Euclidean space is a beautiful topic that should have a permanent place in the school curricula. Teaching spacial geometry can take on various forms. It could be the traditional teaching using a well illustrated material, getting help from one of the many graphics programs, or using actual 3D models either professionally made or with the students' participation.

John Mayer (UAB) – Our junior/senior level Geometry I course is a Euclidean geometry course now taught (last two Fall Semesters) in an inquiry-based format using Notes written by David Clark, Distinguished Professor SUNY-New Paltz. In this course process is as important as content.

Krystyna Kuperberg, Auburn

Formal mathematics as a teaching tool

Abstract: Proof checkers are computer programs that verify proofs written in a formal language that is very close to the language commonly used by mathematicians. Formalization of mathematics and using proof checker software in the introductory theorem proving courses has been used successfully in a classroom setting. Some examples of formal mathematics written for a proof checker Mizar will be presented.

Hassan Fathallah-Shaykh , UAB

On the dynamics of networks

Abstract: I will discuss conditions for stability, non-convergence, and the presence of limit cycle solutions of systems that model the dynamics of network graphs. These systems are related to the Lotka-Volterra and neural network equations and have applications in biology.

Gary Tiner, Faulkner-Montgomery

On the Erdos-Sos conjecture and graphs without a P_{k+4}

Abstract. If G is a graph with average degree greater than k-2, Erdos and Gallai proved that G contains a path on k vertices. Erdos and Sos conjectured that under the same condition, G should contain every tree on k vertices. Several results based upon the number of vertices in G have been proven including the special cases where G has exactly k vertices (Zhou), k+1 vertices (Slater, Teo and Yap), k+2 vertices (Wozniak) and k+3 vertices (the second author of this paper). To strengthen these results, we will prove the Erdos-Sos conjecture holds if a longest path in G has at most k+3 vertices (no restriction is imposed on the number of vertices of G).

Chadia Affane Aji, Tuskeegee

The Integration of Scilab into College Calculus

Abstract: Powerful computers and mathematics programming languages, such as MATLAB® and Scilab, offer opportunities to build a clear understanding of the key concepts of mathematics, science, and engineering. MATLAB is a powerful computing and graphing tool widely used in academia and industry. Many college students, however, will not need or be able to afford MATLAB to enhance their learning of mathematics. Scilab is a free open-source alternative to MATLAB that allows students to experience a mathematics programming language and some of the opportunity for learning that such software provides. It allows interested teachers to introduce students to mathematics concepts through experiential learning that can build their mathematical confidence, creativity, and ability to communicate mathematically. In this paper, we will demonstrate some of the basic features of Scilab software and its educational use as an introductory mathematical programming language in college calculus.

Jerome Goddard, AUM

Where have all the fish gone? A mathematical study of diffusive population models with harvesting

Abstract: There has been considerable interest over the past decade in studying the effects of overharvesting on animal populations in order to ascertain viable yet sustainable harvesting levels. The following quote from a 2003 USA Today article shows one such example: "Commercial fishing has wiped out 90% of the world's populations of large fish, scientists say. …And scientists fear that the damage may be beyond repair. … More international agreements to manage fisheries are needed, industry representatives and conservationists agree. Such efforts have stabilized some swordfish, tuna and salmon populations for example, while stocks of North Atlantic redfish and cod have failed to recover." (USA Today, 5/15/2003, Life Section: Pg. 12D) One approach to studying the effects of harvesting on a population is through the use of reaction diffusion equations to model such phenomena in a theoretical population. For over 60 years, reaction diffusion models have been employed to explore the dynamics of varied populations, such as the large fish populations referenced in the aforementioned quote. Even though analysis of reaction diffusion models has provided valuable insight into the problem of overharvesting, much is still not known about their dynamics. In this talk, we will compare the dynamics of a population model with logistic growth rate & a form of density independent harvesting (constant yield harvesting) both with and without diffusion. Additionally, we will detail recent results in the case when a certain nonlinear boundary condition is used to model negative density dependent emigration on the boundary of the population patch. The dynamics of the model under the addition of this nonlinear boundary condition are extremely complex with multiple equilibrium states for the same harvesting rate. These theoretical results may help to provide some insight as to why some populations never recover to former levels even when the harvesting rate is greatly reduced. Additional Authors: R. Shivaji & E. Lee.

Alabama Journal of Mathematics

The Alabama Journal of Mathematics is published through cooperation between the AACTM and the Alabama Council of Teachers of Mathematics (ACTM), has published the 2011 volume, and can be found at: http://ajmonline.org

Business Meeting Agenda

1. Report of Secretary/Treasurer
2. Election of Officers
3. Old Business
4. New Business
    a. State Mathematics Contest
