Session 1

3:30-3:45 A long Cycle on the middle graph of the Hypercube

Mahmoud El-Hashash, Bridgewater State College

Let Q_n be the n-dimensional hypercube and the weight of a node is the number of ones in its binary representation. If n=2k+1, then the subgraph $H_n = Q_n(k,k+1)$ of Q_n induced by the nodes having exactly weights k or k+1 is called the middle graph of the hypercube. In previous paper, we proved that H_n is Hamiltonian for $3 <= n <= 13$. Since we could not prove, in general for $n>13$ that H_n is Hamiltonian, in this paper for $n>= 3$, and $0<k<(n-1)$, we present a recursive construction for a long cycle in $Q_n(k,k+1)$ and a recurrence relation for its length and solve it. We also conjecture that, for a fixed k, the limit, when n goes to infinity, of the length of that cycle divided by the length of the largest possible cycle is 1.

3:50-4:05 The Category of Long Exact Sequences and the Homotopy Exact Sequence of Modules

C. Joanna Su, Providence College

The relative homotopy theory of modules, including the (module) homotopy exact sequence, was developed by Peter Hilton. Our thrust is to produce an alternative proof of the existence of the injective homotopy exact sequence with no reference to elements of sets, so that one can define the necessary homotopy concepts in arbitrary abelian categories with enough injectives and projectives, and obtain, automatically, the projective relative homotopy theory as the dual.

In addition, having established a few new examples of nontrivial (absolute) homotopy groups of modules in the previous paper, we shall here pursue the relative (module) homotopy theory analogously to the absolute (module) homotopy theory. For these purposes, we embed the relative category into the category of long exact sequences, as a full subcategory, in our search for suitable notions of monomorphisms and injectives in the relative category.

4:10-4:25 Low-dimensional Modeling in Annular Convection

Dan Rusu, Massachusetts College of Liberal Arts

Spatio-temporal vortex patterns arise in radially forced convection of a fluid in an annulus. A thermoconvection model based on the two-dimensional Boussinesq fluid equations is analyzed using equivariant bifurcation theory, coupled with an asymptotic numerical algorithm. The study of the long-time behavior of the solutions of the original O(2)-symmetric PDE system is reduced locally to that of solutions of an ODE system, in which the symmetry properties are preserved. We conclude that the behavior is quite different when Prandtl number of the fluid is very small (as for a Jovian planet atmosphere) if compared with the case of moderate Prandtl number fluids (as Earth's equatorial troposphere). A possible extension of the method is to annular electroconvection.

Session 2

3:30-3:45 A Few Sports Related Applications of Mathematics and Statistics
(or: How I spent my four years in the Seaway Section...)
Rick Cleary, Bentley College

We examine a few recent examples in which popular sporting events have been modeled using mathematics and statistics. We also consider two possible future research problems that examine the relative merits of a variety of mathematical and statistical models in their solution.

3:50-4:05 Electoral College Reform: A New Paradigm for Electoral Arithmetic
Jim Wright, Green Mountain Collge

The 2000 Presidential election refocused attention on the actual election process. The current winner-take-all procedure used in allocating state electors is used in all but two of the states. An overview of the current electoral structure and alternative methods will be discussed along with a historical perspective using these alternative methods.

Session 3

3:30-3:45 Math Online: Moving Mathematics into the Lab
Chris Bernhardt, Laura McSweeney, Steve Sawin and Joan Weiss, Fairfield University

The goal of the Math Online system is to enable students to become more active learners of mathematics. Via randomly-generated multiple-choice questions delivered through a web based system, students practice various computational techniques in online quizzes until they feel secure in their knowledge of the particular procedures. By a mastery due date students must pass with a predetermined minimum score, similar randomly generated quizzes which must be taken in the Math Center in proctored mode outside of the scheduled class. This should provide more class time for instructors to assist students to achieve a more in-depth understanding of the underlying principles and the precise style of mathematical thinking and encourage the inclusion of additional topics and applications of mathematics. In 2000-01 twelve to fourteen sections of Applied Calculus I and II were taught by six to seven instructors, each with two sections. One section used Math Online and the other was taught in the instructor's usual method (e.g. using lots of in-class quizzes to test basic skills). Assessment of the online system was done using data collected from a comparative study conducted in these introductory calculus courses. Results will be discussed from the preliminary trial run conducted last academic year.

3:50-4:05 Maple And The Wireless Laptop In Calculus III at Framingham State College
Sarah L. Mabrouk, Framingham State College

During Fall 2001, my students and I are participating in the College's Wireless Laptop Program. As part of the program, each student is assigned a laptop that he/she uses throughout the semester. The laptop enables the students to access materials that I post on the course web site

from anywhere on campus using the wireless network and from other locations using an Internet Service Provider. In addition, since Maple is installed on the laptop for each student in the class, the students are learning to use Maple as a tool in visualizing and manipulating the mathematics that they are learning.

In this paper, I plan to share my first experiences using Maple as a tool in teaching Calculus III. I will share some of my experiences in learning Maple and some resources that others planning to use Maple for the first time might find to be helpful. I will discuss some of the Maple worksheets that I have created to help the students to learn and to use the software and some of the challenges in using Maple and technology in general in teaching Calculus III. In addition, I will share some student reaction to using Maple and wireless laptops in Calculus III.