Department of Mathematics

October 2, 2009

UNDERGRADUATE MATHEMATICS SEMINAR

The next seminar will be

DATE: **MONDAY, October 5th**

Time & **4:15pm –** Refreshments in the Math Common Room, **Bailey 204**

Location: **4:30pm –** Seminar in **Bailey 201**

In this seminar, Union College's **Professor Julius Barbanel** will present the following talk:

TITLE: Irrational Numbers: discovery, crisis, and resolution

ABSTRACT: Pythagoras and his followers (who lived and worked about 2500 years ago) thought it obvious that any two line segments are commensurable, or, in other words, that given any two line segments, there is some third line segment that measures each. This assumption turns out to be equivalent to the statement "all real numbers are rational." Many ancient Greek geometric proofs used this assumption. When it was discovered that this assumption is false, it caused a major mathematical crisis. We shall explore the reasons why the Pythagoreans made this commensurability assumption, the discovery that it is false, the ensuing mathematical crisis, and the resolution of this crisis by Eudoxus.

Mathematical Moments: Math and the H1N1 Virus?

The American Mathematical Society, under the heading of "Mathematical Moments", has produced "a series of posters that promote appreciation and understanding of the role mathematics plays in science, nature, technology, and human culture." One recent poster, now posted on bulletin boards around Bailey Hall, is entitled "Resisting the Spread of Disease" and it gives a brief overview of how the spread of disease is often modeled mathematically via the "SIR" model. In this model, the population is segmented into three categories "those susceptible (S) to a disease, those infected (I) with it, and those recovered [resistant or vaccinated] (R) from it" and ordinary differential equations are used to relate how changes in one of these variables over time affects the other variables. More recently, though, discrete models using graph theory and social networking theory have been developed to model the spread of disease through individuals. At its very simplest, each person represents a node in a graph, and edges represent contacts with other individuals. To learn more about this, there is a downloadable podcast (built into a pdf file of the poster available at http://www.ams.org/mathmoments/) of an interview with Mac Hyman of Los Alamos National Laboratory.

Modeling Currents for Cleaner Seas

The New York Times this week published an article by Bina Venkataraman http://www.nytimes.com/2009/09/29/science/29chaos.html?emc=eta1 describing the progress that mathematicians and engineers have made in modeling ocean currents and how the improved models are being used to keep, for example, the Monterey Bay, cleaner, by predicting when chemical waste that is dumped into the bay will flow out to the ocean and become diluted (good), and when it will stay and circulate within the bay (bad). The theoretical "Lagrangian coherent structures" that have been discovered can also be used to "explain why aircraft meet unexpected turbulence, why the air flow around a car causes drag and how blood pumps from the heart's ventricles." You are encouraged to read this interesting article.

Back Issues of the Math Newsletter Are Available Online Through the Math Department's Website:

www.math.union.edu

FREE CALCULUS TUTORING
Available at the **Calculus Help Center** in Sorum House

Sun-Thurs, 7:30-10:00pm

Putnam Exam 2009: Get Ready!

Do you like challenging problems? Do you immediately seek out the Problem of the Newsletter when you receive this newsletter? Then you should consider participating in the **William Lowell Putnam Mathematical Competition**, what Time magazine called the "world's hardest math contest" (Dec. 22, 2002). Thousands of students from hundreds of colleges and universities across the U.S. and Canada take part in this one-day competition on the first Saturday in December each year. The competition consists of 12 challenging problems. Students are given six problems at a time in each of two three-hour sessions. Each problem is scored from 0-10, so the theoretical maximal score is 120. The typical median score is 0 or 1 point! (We did say it is *challenging!)*

Last year, Union's team did very well, with several students scoring well above the median.

This year's exam will take place on **Saturday, December 5th**. Although this is after the fall term ends, we can make arrangements for you to stay in your dorm room the nights before and after the exam, or possibly take the exam at an institution closer to your home.

If you think you might be interested in taking the exam, please contact **Professor Paul Friedman** at friedmap@union.edu by **Thursday, October 8th.**

Problem of the Newsletter: October 2, 2009

Last week's problem was taken from the website http://math.scu.edu/putnam/gradecJan.html for the Putnam Exam. Though no one has yet submitted a solution to it, **Schuyler Smith** has made a conjecture concerning the solution. So, this week's problem is to re-attack last week's problem, trying to prove (or disprove) Schuyler's conjecture.

The problem: Players 1, 2, 3,…, n are seated around a table and each has a single penny. Player 1 passes a penny to Player 2, who then passes two pennies to Player 3. Player 3 then passes one penny to Player 4, who passes two pennies to Player 5, and so on, players alternately passing one penny or two to the next player who still has some pennies. A player who runs out of pennies drops out of the game and leaves the table. Find an infinite set of numbers n for which some player ends up with all n pennies.

Suggestion: Play the game with n=6 and then n=7 players to see what can happen.

Schuyler's Conjecture: If there are 2^k+1 or 2^k+2 players, then some player will ends up with all n pennies.

Professor Friedman will accept solutions to this problem until noon Thursday, October 8th. Email your solution to him (friedmap@union.edu) or put it in his mailbox in the Math Department's office on the second floor of Bailey Hall.