Department of Mathematics

February 3, 2012

UNDERGRADUATE MATH SEMINAR

DATE: **TUESDAY, February 7th**

Time & **4:45pm –** Refreshments in **Bailey 204**

Location: **5:00pm –** Seminar in **Bailey 207**

In this week's seminar, the Union College Math Department's **Professor Karl Zimmermann** will present the following talk.

TITLE: Commuting Quadratic Polynomials

Take a few minutes and try to find two polynomials that commute under composition, that is, find polynomials f(x) and g(x) with f(g(x)) = g(f(x)). There are some fairly easy examples, but beyond these few, the search can be difficult. In this talk, we'll start with some easy examples and use these to build some new ones. To illustrate that there aren't too many examples to be found, we'll show that a quadratic polynomial can commute (under composition) with at most one polynomial of any given degree.

Math Club News

- **HELP NEEDED!** The Math Club is teaming up with the Kenney Community Center and will be manning a table at Central Park Elementary School on **February 8** from 6:00 to 7:30pm. This is an event held by a local elementary school for students and their parents to learn about math and generate interest in the student body. We'll be teaching three different things: geometry with origami, estimation with guessing games, and also highlighting math across various disciplines. We are looking for 5-7 students who are willing to volunteer with us. **Please contact Becca Robinson** (robinsor@union.edu) if you are interested in this cool community service opportunity!
- **MATH ACROSS THE DISCIPLINES.** Mark your calendars for **Wednesday, February 22** at **5:00pm**. We'll be hosting a panel of professors from other departments talking about the overlap between their discipline and math. It is a great way to see what you can do with a math major other than pure math. We'll have pizza so come hungry!

New Course This Spring: Topics in the Mathematics of Voting (MTH 460)

In most years, the Mathematics Department offers two courses per year at the 400 level –classes that present challenging material at a sometimes high level of abstraction. Mathematics students can complete the standard mathematics major at Union without ever touching one of these classes, but to graduate with honors requires at least two 400-level classes. Past offerings at the 400-level have included Topology, Abstract Algebra II, Foundations of Mathematics, Category Theory, and Game Theory (with some having been offered only once), but this will be the first time the department offers a course in the theory of voting at this level.

Occasionally the topic for a class is determined by the interest of the instructor – and this is one of those times. **Professor Bill Zwicker** will teach the class, and he is very enthusiastic about the mathematics of voting – in fact, he has published over 20 research **(Continued on Next Page)**

papers in the field, as well as a book. The book, as well as 7 of the papers, was co-written with Professor Alan Taylor (who has two other books, as well as a number of other papers on this subject), while 3 others were co-written with Professor Davide Cervone. Two of Bill's papers had Union undergraduates as authors, with the most recent paper having 6 undergraduate co-authors. Professor Chris Hardin has also published in voting theory (and Professor Julius Barbanel has written extensively in the closely allied area of fair division), so you can see that Union is actually one of the world's major research centers in the mathematics of voting.[1]

In fact, much of the syllabus of the course will be drawn from the research of Union's own mathematicians, with students reading several of the original articles and books mentioned above. The topics will be chosen from two of the major fields of voting theory:

- Voting yes or no on a proposal (Simple Games and related models)
- Multicandidate Voting (Social Choice)

Mathematical interest and depth will play a role in the selection of topics within these two broad areas. You will be learning convexity theory and applying some of the linear algebra you saw in MTH 340 (a pre-requisite for MTH 460). Some of the topics will be quite geometric in flavor, while others will be combinatorial.

Is the course for you? Yes, if

- you have taken at least two mathematics courses at the 300 level (including Linear Algebra)
- you like the idea of reading some original research articles (painful and slow, but rewarding, and good preparation for thesis)
- you understand that any 400-level course will be challenging
- and you think that applying mathematics to voting sounds interesting . . . even if you don't yet have a clear idea of what that might mean.

Questions? Drop by Bill's office, Bailey 200B – he'll be happy to tell you more.

[1] While this may be a true statement, we are having a bit of fun . . . voting theory is not exactly one of the biggest subfields of mathematics; the competition for "major research center" is not intense.

Chuckle Chuckle: A vector walks into the bar. After the patrons size him up, they yell "Norm!"

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Problem of the Newsletter: February 3, 2012

A solution to last week's problem has been posted on the bulletin boards.

This week's problem: Some more fun with calculus. Let *a* be a positive real number. Find the value of *a* such that the definite integral below achieves its smallest possible value.

$$\int_a^{a^2} \frac{dx}{x+\sqrt{x}}$$

Professor Friedman will accept solutions to this problem until noon Thursday, February 2nd. 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.