Department of Mathematics

February 5, 2010

UNDERGRADUATE MATHEMATICS SEMINAR

Bookmark it! The seminar schedule, abstracts, and (sometimes) slides presented by a speaker can be found http://www.math.union.edu/activities/seminars/student/welcome.html.

The first seminar of the winter term will be:

DATE: **MONDAY, February 8th**

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

4:30pm – Seminar in **Bailey 207**

In this seminar, Union College's **Professor Karl Zimmermann** will deliver the following talk:

TITLE: Commuting Polynomials and Generalized Odd Polynomials

ABSTRACT: It is well known that polynomials commute under addition and multiplication, that is, $f+g=g+f$ and $fg=gf$ for polynomials f and g. On the other hand, polynomials may not commute under function composition. In fact, it is likely that $f\circ g\neq g\circ f$. In the first part of this talk, we'll look at polynomials that do commute under composition. Then, we'll review the concepts of even polynomial and odd polynomial and generalize the latter. Finally we'll see a connection between these generalized odd polynomials and polynomials that commute under composition.

Homework: Try to find some examples of polynomials that commute under composition!!

Pieces of Theses: A View from Sean Conerly, '10

To The Current and Future Thesis Writers,

My name is Sean Conerly. I am a senior and in the fall I completed my one-term Mathematics thesis on the Finite Element Method (FEM). FEM is a technique used to evaluate, and very closely approximate, the solutions to partial differential equations (PDEs). The uses for FEM are extraordinarily many. FEM is use for fluid flow by mathematicians and physicists, for elastic and thermal problems by mechanical engineers, and for electrostatics by electrical engineers. FEM became popular in the 1960's when Ray W. Clough, who coined the phrase "Finite Element Method", implemented this process in his work with civil engineering. FEM was then, and is now, an incredibly useful technique because of it versatility and accuracy over complicated regions. For example, FEM is useful when trying to simulate, the weather pattern on Earth, where it is more important to have accurate predictions over land than over the sea. FEM is also a very functional technique to use when trying to approximate the stiffness or durability of materials; specifically, when trying to predict the damage to the hood of a car when in a crash. Real world applications, such as the car crash, of FEM require computer computation. However, for more simple cases we can apply the method manually.

The Finite Element Method is, in short, comprised of four steps. Identify the System, Form a Variational Problem for the System, Discretize the Domain, Yield a Function Approximation. With the use of basis functions, boundary integrals, nodes, linear combination concepts and MATLAB we can compute the results of FEM.

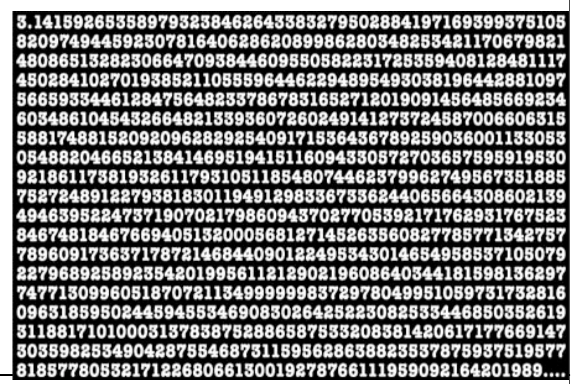
(continued)

However, in my opinion, more important than what I studied is the thesis process itself. I would be remiss if I did not warn you about the tedious nature of the Thesis process. Unlike any other class you have taken, your Thesis Presentation is your Thesis Presentation. Therefore, you have to research everything, you have to derive and be able to clearly explain every step of your research and application. Also, it is really easy to fall behind and to feel lost. Therefore, procrastination cannot be an option and will surely negatively impact the quality of your presentation. Do not panic, this is typical. Simply continue to work hard and trust that your hard work will, in fact, pay off greatly.

In closing, as scary as all of this may sound, I have benefitted greatly from the thesis process. I definitely feel I manage my time more efficiently. More importantly, I gained a completely new and relevant set of knowledge about a topic I never knew existed. I hope that your experience with thesis will be as beneficial as mine was. Good luck, and remember that it is not about how much you have to stress or how lost you feel, it is about your ability to, simply, persevere.

Record Number of Digits of Pi Calculated

As reported by the BBC News (http://news.bbc.co.uk/2/hi/technology/8442255.stm), Fabrice Bellard claims to have computed the first 2.7 ***trillion*** digits of pi, establishing a world record. The record setting computation took 131 days on a desktop computer to complete and check. The previous record, some 123 billion digits less than what Bellard calculated, was set using a supercomputer in Japan that is 2000 times faster than the desktop used in this recent work and required only 29 hours of computing time.

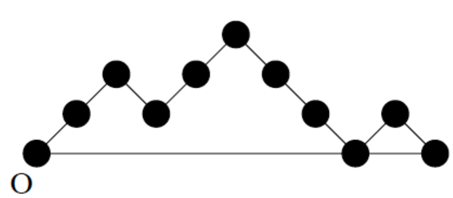


Problem of the Newsletter: February 5, 2010

Congratulations to recent Union graduate, **Andy Mackenzie '09** for correctly solving last week's Problem of the Newsletter, and an honorable mention to **Tomas Kourim** for progress toward a solution. Andy's winning solution has been posted on the bulletin boards in Bailey Hall.

Here is this week's problem: Andy Mackenzie had so much fun with last week's Putnam Exam problem that he suggested this week's problem should be another Putnam Exam problem from a while back that he enjoyed playing with. Here it is.

A Dyck n-path is a lattice path of n upsteps (1,1) and n downsteps (1, -1) that start at the origin O and never dips below the x-axis. A return is a maximal sequence of contiguous downsteps that terminates on the x-axis. For example, the Dyck 5-path illustrated has two returns, of length 3 and 1 respectively. Show that there is a one-to-one correspondence between Dyck n-paths with no return of even length and the Dyck (n-1)-paths.



Professor Friedman will accept solutions to this problem until 12:00 noon Thursday, February 11th. Email your solution to him (friedmap@union.edu) or put it in his mailbox in the Math office in Bailey Hall.