Colloquium Talks

Hercules and the Hydra
Pedro Poitevin, Salem State College

Abstract: We will give an amusing mathematical retelling of the classical story of the battle between Hercules and the hydra. We will introduce transfinite ordinal numbers, explain their role in helping us understand the possible outcomes of the battle, and highlight surprising connections to mathematical logic.

Date and Time: Tuesday, February 3, 4:30-5:30 pm in CMC 206

Frames and the Uncertainty Principle in Time-Frequency Analysis
Jan Cameron, Texas A&M University

Abstract: You may have heard of the Heisenberg uncertainty principle, or even studied the result in a physics or chemistry class. It is less known that a similar principle is at the heart of the “localization problem,” one of the deepest mathematical problems in time-frequency analysis. Time-frequency analysis is the area of mathematics devoted to understanding how the frequency and spectral content of signals (e.g. sounds, images, electrical activity) evolve through time, and how this information can be stored digitally. In this talk, we will develop some basic tools of time-frequency analysis, and see how one tool in particular, frame theory, emerges as a means to address the localization problem. Frame theory is not only useful for applications in engineering and signal analysis, but also has deep connections to several areas of mathematics. As time permits, we will explore a few such connections, and discuss some current avenues of research in frame theory that may be of interest to you.

Date and Time: Thursday, February 5, 4:00-5:00 pm in CMC 206

Math in the Summertime

Are you a woman finishing your first or second year at Carleton who is considering graduate school in mathematics? This summer, Carleton will host the 13th Summer Mathematics Program for Women. SMP brings together 18 talented young women from across the country to study math in an intense environment for one month. Participants take two classes, do homework, listen to speakers, and become part of an established network of talented women studying mathematics. Talk to Deanna (dhaunspe) for more information.

Curious about Studying Math in Budapest?

Come visit with students who have spent a term in the Budapest math program. They will share some of their experiences and answer your questions about life and math in Budapest. Cookies and soda will be provided!

Tuesday, February 3 7:00 p.m. in CMC 206
Opportunities for Carls

What are you doing this summer? Haven’t decided yet? Check out these research opportunities!

The Mathematical Sciences Research Institute Undergraduate Program (MSRI-UP), currently in its 3rd year, is seeking student researchers for this summer’s program in Berkeley, CA. Students will research, present their research, network with older mathematical mentors, and receive guidance in applying for graduate programs and fellowships. Students finishing their sophomore or junior year are preferred, and underrepresented groups are especially sought. Apply online at www.msri.org/up before March 2.

If you are interested in science and engineering as well as mathematics, you may want to look into the Center for Compact and Efficient Fluid Power (CCEFP) REU. You will get hands-on experience conducting original research. There are locations all over the United States, including in Minneapolis. For more information, go to www.ccefp.org.

Additionally, be sure to utilize the Career Center; it can be very helpful in all capacities, from writing a resume to finding a summer program to obtaining a post-graduation job.

Fun Math Fact

Ah, imaginary numbers! For those who want a quick interesting fact about them, take note that $i$ raised to the $i$th power is actually a real number! If so inclined, you can prove this fairly quickly. For a hint: use Euler’s formula.

Problems of the Week

1. If in the addition

\[
\begin{array}{c}
N \ O \ W \\
D \ O \\
+ \ T \ H \ I \ S \\
\hline \\
M \ A \ T \ H \\
\end{array}
\]

each of the letters A, D, H, I, M, N, O, S, T, W stands for a different digit (in base 10; note that the letter O may not correspond to the digit 0, and that, as usual, no number starts with the digit 0, so D, M, N, T are nonzero digits), find

a) the smallest possible MATH and
b) the largest possible MATH.

2. Consider the number of solutions to the equation $\sin x + \cos x = \alpha \tan x$ for $0 \leq x \leq 2\pi$, where $\alpha$ is an unspecified real number. (For example, if $\alpha = 0$ the solutions will be $x = \frac{3\pi}{4}$ and $x = \frac{7\pi}{4}$, so the number of solutions will be 2.) What are the possibilities for this number of solutions, as $\alpha$ is allowed to vary?

Still not much to report (grumble), although one attempt on last week’s first problem was submitted and another may be in the works. My own solutions to the problems posed January 9 have been posted in the hallway outside CMC 218.

- Mark Krusemeyer