

# Math News

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## A Little (More) Fun

Puzzle: For positive integers  $m$  and  $n$ , solve  $m^n = n^m$ .

Solution: It's trivial for  $m = n$  and if  $m = 1$  then  $1^n = n^1 \Rightarrow m = n = 1$ . We may assume without loss of generality that  $n > m \geq 2$ . Then  $\frac{m^n}{m^m} = \frac{n^m}{m^m} \Rightarrow m^{n-m} = \left(\frac{n}{m}\right)^m$ . Since  $m$  is an integer, let  $k = n/m$  for some integer  $k$ . Then  $km = n$ , and  $m^{km-m} = k^m \Rightarrow m^{m(k-1)} = k^m \Rightarrow m^{k-1} = k$ . Since  $m \neq n$ ,  $km = n \Rightarrow k \geq 2$ . For  $k = 2$ ,  $m^1 = 2 \Rightarrow n = 4$  (since  $n = km$ ). And we have  $2^4 = 4^2$ . For  $k \geq 3$ :  $k = 3 \Rightarrow m^2 = 3$ , But  $m \geq 2$ , so  $m^2 > 3 \Rightarrow k \neq 3$ . Further, proof by induction shows  $m^{k-1} \neq k$  for all  $k \geq 3$ . Therefore,  $2^4 = 4^2$  is the only solution in the positive integers.

## Further Fun

If, in the problem just above, we do not restrict  $m$  and  $n$  to be integers we can consider when the exponential function  $y = k^x$  and the power function  $y = x^k$  intersect. Why not investigate that between now and our November issue?

## New Chair, Big Plans

Our Math department welcomes Dr. Justin Dunmyre as the new Chair. Although Dr. D started as an undergraduate computer science major, when he took Foundations and Number Theory courses he became hooked on math's aspects of puzzle-solving, logic, and proofs. When he studied in Tokyo, he became ever more drawn to playing with math in his free time. His Ph.D. (at Univ. of Pittsburgh) involved applying ideas of differential equations to neuroscience! Gradually Dr. D has evolved to be increasingly excited by teaching students, so one downside of being Chair is that usually he only gets to teach two courses per semester.

Some of Dr. D's goals for our department include the following: Increase the diversity of our faculty (including with a current search); Support faculty attendance at conferences and other professional development; Re-design the math major curriculum to include a data science component that better serves more students' career paths (He remarks that the math major *should be* one of the most attractive on campus, since math is so full of beauty and since math is perhaps the most flexible discipline in terms of applications); Grow the Learning Assistant Program to even more courses, including sharing this idea with other departments at FSU (To this end, Dr. D has received a prestigious USM Elkins Professorship!); Support faculty in active and inclusive teaching methods.

Dr. Dunmyre and his wife Elizabeth have three children and reside in Frostburg.

## KME Corner

KME will have a bake sale (with mini pancakes) on Thursday, October 11 from 9:00 until noon. New officers are President: Demetrick McDonald; Vice President: Braden Ebersole; Treasurer: Zach Kline ; Secretary: Jordan Thomas.

## Dead Poets Society Schedule

9/21 - Puzzles @ 3:00  
9/28 - Board Games @ 3:00  
10/05 - Puzzles @ 4:00  
10/12 - Rockband @ 3:00  
10/19 - Puzzles @ 3:00  
10/26 - Board Games @ 3:00  
11/02 - Puzzles @ 4:00  
11/09 - Rockband @ 3:00  
11/16 - Puzzles @ 3:00  
11/30 - Board Games @ 3:00  
12/07 - Puzzles @ 4:00

## Whites Solve Problem in MAA Journal

Retired FSU faculty members Edward and Roberta White have had published in May 2018 their solution to a Mathematical Monthly problem, entitled "An Integral with Fractional Part of Tangent." The esteemed lifelong learners

proved that  $\int_0^{\pi/2} \frac{\{\tan x\}}{\tan x} dx = (1/2) \ln((2\pi)/(1 - e^{-2\pi}))$ ,

where  $\{u\}$  denotes  $u - \lfloor u \rfloor$ .

## Alumna Update

FSU mathematics alumna Rachel Skipper has completed her Ph.D. in the field of geometric group theory from SUNY Binghamton. She has been awarded a prestigious post-doc at Georg-August-Universität in Göttingen, Germany, where Gauss, Riemann, Noether, Hilbert, & Klein all worked, and at École Normale Supérieure de Lyon in France. After her year-long post-doc, Rachel will assume a position at Ohio State University.

## Career & Internship Fair

Don't miss out on the fall Career & Internship Fair on Wednesday, October 10<sup>th</sup> from 10:00am to 2:00pm in the Lane University Center ARMAH. It is designed for students of ALL class ranks, so don't think you need to be a graduating senior to attend. Now is the time to check out internships and careers that are available to you, so mark your calendar today.