MSCS Mess

Department of Mathematics, Statistics and Computer Science
St. Olaf College
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This Week's Colloquium

Title:	All I Really Need to Know I Learned from Polygons
Speaker:	Joshua Bowman, Cornell University
Time:	Tuesday, March 21, 1:30 p.m. (treats at 1:15)
Place:	SC 182

Translation surfaces are surfaces with a curious metric property: at most points, the surface is flat, like the plane, but a few points look like cone points with angles of *more* than 2π. We can form such surfaces from polygons in the plane by (abstractly) gluing their edges via translations.

Translation surfaces have applications in the study of (at least) two dynamical systems: polygonal billiards and interval exchange maps. But they also have deep roots in complex analysis, algebraic geometry, topology, hyperbolic geometry, and number theory—all subjects Joshua once thought would be neat to learn, but never seemed to have the chance to study. Joshua will touch on some of these connections as he explores some of the fundamental properties of translation surfaces.

All you need for this talk is some geometric imagination, an understanding of what a 2×2 matrix is, and a certain level of comfort with abstract constructions.

Joshua Bowman graduated from St. Olaf in 1999 with a degree in mathematics and music. He is now a graduate student in mathematics at Cornell University. In his spare time Joshua likes to pretend he is still a liberal arts student by folk dancing and singing in choirs. And after years of bringing math homework into the music library at St. Olaf, he now brings music into the math building at Cornell.

Problem of the Week (POW)

True or False: Every cubic polynomial agrees with its derivative at some point; that is, there exists a real number c so that $f(c) = f'(c)$.

Either give an explanation or a counterexample.

Challenge POW: True or False: Every polynomial with a real root agrees with its derivative at some point.

*** Please submit all solutions by Wednesday at noon to Amelia Taylor by e-mail (ataylor@stolaf.edu) or by placing them in her box at OMH 201.

Last Week's Problem

Find a solution to the following system of simultaneous equations:

$x^4 - 6x^2y^2 + y^4 = 1$
$4x^3y - 4xy^3 = 1$
where x and y are real numbers.

Thanks to Paul Zorn for submitting a solution to last week's POW. The following solution is his:

Translating to polar coordinates and using the double angle formulas repeatedly gives the new equations $r^4(\cos(4\theta)) = 1$ and $r^4(\sin(4\theta)) = 1$. Hence $\tan(4\theta) = 1$ and $r^4 = \sqrt{2}$. This means that a solution has polar coordinates $[2^{\frac{1}{8}}, \frac{\pi}{16}]$, or (approximate) Cartesian coordinates (1.07, 0.21). The "opposite" point (symmetric across the origin) is another solution.

POW Archives

The following POW appeared in the MSCS Mess two weeks ago:

Let S be a set with an associative multiplication, $(x,y) \rightarrow xy$. Suppose that for all x, y in S, $x^3 = x$ and $x^2y = yx^2$. Show that the multiplication is commutative.

Thanks to Paul Zorn for submitting a solution to this POW as well. Let $x, y \in S$. Then $xy = (xy)^3 = (xy)^2xy = (((xy)^2)x)y = x(xy)^2y = x(xy)(xy)y = (x^2y)(xy^2) = (yx^2)(xy^2) = y(x^3y^2) = y(xy^2) = y(y^2x) = y^3x = yx$.

The first, ninth, and twelfth equalities follow from the first relation; the fourth, seventh, and tenth equalities follow from the second relation; the remainder are all from associativity and just rearranging the parentheses a little bit.

n^{th} Annual Math Recital

Are you talented? Yes! Of course you are! You're part of the MSCS community. We're smart and witty and we tell good jokes.

Except, of course, for those of us that don't.

Regardless of which camp you belong to, you are cordially invited to attend and participate in an evening of entertainment by MSCS students and faculty on Tuesday, April 11 at 7:00 p.m. in Ytterboe Lounge. In past years, the entertainment has ranged from singing to piano performances to dramatic readings to skits. All levels of talent can be accommodated (see, we told you you were talented enough). Besides, an impressive array of goodies will be provided courtesy of the kitchens of various MSCS faculty members.

We repeat: WE NEED YOU! We know there are many multi-talented students in the MSCS department, so please consider sharing your creativity with everyone else.

If you are interested in participating, please contact Master of Ceremonies Amelia Taylor (ataylor@stolaf.edu). This is the best annual MSCS event that does not involve roasting a pig (but depending on your cooking skills, you could change even that!). So even if you're not planning to take the stage (even though you should! Everyone else will be doing it!) put this event on your calendars NOW!

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