

POINTS AND ANGLES

Newsletter of the Metropolitan
Mathematics Club of Chicago



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DYNAMICS IN DISGUISE SOME CLASSICAL PROBLEMS IN NUMBER THEORY

Amie Wilkinson
Mathematics Professor
Northwestern University

BY CONRAD WAYNE

Several beautiful results in number theory are connected to techniques and phenomena in dynamical systems. Dr. Wilkinson will describe some of these results and how high school students can discover these connections on their own. As a college professor, she looks at high school mathematics in a little different way than many of us do. This outlook may help us look at high school mathematics in a different way as well as ask questions of our students a bit differently.

Dr. Wilkinson is a graduate of Evanston Township High School. She received her undergraduate degree in Mathematics from Harvard and her PH.D from University of California, Berkeley. After teaching for a year at Harvard, she returned to her “roots” and has been a full time professor at Northwestern since 1997.

Get a head start on the holiday season by joining fellow MMC members (as well as some of her former mathematics teachers!) for an enlightening evening. Also, in carrying on with an MMC holiday tradition, chicken will be put on the “back burner” and broiled double thick cut strip steak will be the entrée.

REMEMBER!! You can earn CPDU credits for attending dinner meetings!

Date: Friday, December 1, 2006
Time: 5:30 p.m. Doors Open
6:00 p.m. Social Hour
7:00 p.m. Dinner and Talk
Place: Fountain Blue Banquets &
Convention Center
2300 Mannheim Rd.
Des Plaines, IL
(847) 298-3636
Cost: Members \$31
Nonmembers \$37

RESERVATION DEADLINE
Monday, November 27th, by noon,
please!

TO RESERVE:
Call Evanston Math Department at
(847) 424-7600 or
email: reservations@mmcchicago.org
Requests for special meals *must* be made
in advance.



**From Southbound I-294 &
Eastbound I-290:**

Exit at I-190 West to O'Hare; Exit onto North
Mannheim Rd.; Take Mannheim Rd. North
2.25 miles.

From Northbound I-294:

Exit at West Touhy Ave.; Take Touhy Ave. to
Mannheim Rd.; Turn right on Mannheim Rd.

Public Transit:

Take the CTA Blue Line to the Rosemont
Bus Terminal; Take Pace Bus #223; Exit at
Touhy Ave. & Lee Rd.; Walk East on Touhy
to Mannheim Rd.

Future Meetings:
January 19, February 23,
April 13, May 11

INSIDE...

Points From the Interior 2
October Talk Summary 3
MMC Annual Contest insert
Scholarship Information 5

Points From the Interior of the Angle

BY RICH RUKIN

A few years ago, we had a college professor from Northwestern come and give a presentation to our students. She showed them some interesting problems. I recall one in particular about logarithms, which was different than the ones I was used to seeing in Algebra 2. I realized that we tend to become insular, just repeating what we've been doing over and over for years. As a result, we miss out on ways to expand our knowledge, help our students see connections, and hopefully understand math better.

One way to keep up with new ideas, and just see old ideas in new ways, is to be sure to attend meetings like MMC, ICTM, T3, and NCTM. I know I've said this before, but let me urge you to go to sessions related to mathematics, not just teaching math or technology, but about math itself. That's how we learn.

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You have a chance to do so several times during this MMC year. In November, Terry Wyberg showed us math in puzzles, in December Amie Wilkinson from Northwestern will show us more interesting math problems, and in April Gene Olmstead will give a talk with the intimidating title "The Locus Construction and Derivation of Polar Equations." These are precisely the kinds of talks we all need to attend. I'm sure that I'll learn something from Gene that I can use in Geometry; I know I'll learn from Amie things I can use in my Algebra 2 class. But even if I don't, I'll learn some math I didn't know, and that always helps.

Here's one I showed my Algebra 2 classes last week. We're doing rational exponents, and I asked them to simplify $(-64)^{1/3}$. They know the cube root of -64 is -4 . But what about $(-64)^{2/6}$? They can't do the sixth root, then square it. If they square and then do the sixth root, they get $+4$. So is $1/3$ different than $2/6$? This is the kind of question I learned at a presentation many years ago. Now I use it all the time. And have you seen the proofs that $0 = 1$? If you haven't, learn about them and show them to your students. It's better, and more instructive, than solving another twenty equations.

It's hard to get students to think about things if you don't. We have a responsibility to learn ourselves so that we can help students learn as well. See you at MMC.

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The official club website: <http://www.mmcchicago.org/>

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Some Practical Strategies for Ensuring that No Teacher of Mathematics Is Left Behind

BY PHIL GARTNER

Steve Leinwand captivated and challenged the MMC audience with his discussion of the lunacies of some educational mandates coupled with the responsibility we as educators still have to improve our own backyards despite some of these top-down, counter-productive legislative initiatives.

Steve opened with some humor. He is used to speaking to us at the Como Inn or Berghoff, both in Chicago. He is not used to traveling to the current Des Plaines location. Steve presented a table entitled: "A symmetry of time; a panoply of Chicago data." It showed how his trip from Washington D.C. to Chicago took exactly 1 hour and 26 minutes. His taxi ride from the University of Chicago to Fountain Blue was, coincidentally, 1 hour and 26 minutes, despite being only 31 miles compared to a 631-mile journey from D.C.

As the content of his talk unfolded, it was made clear that despite the laws and mandates placed on our schools, students will be left behind if their teachers are left behind. The teachers are key; it is INSTRUCTION, stupid! (This is a play on Clinton's "It's the ECONOMY, stupid," mantra from the '92 campaign). Steve explained that his comments would be part mirror (what am I doing to help students?), part exhortation, and part how-to manual with a blueprint for creating a culture of professional interaction and growth.

He stressed that we have huge problems and our critics are not all wrong. We as educators tend to circle the wagons when attacked, but one can make the case that teachers must shoulder some of the blame and responsibility. Many students are not learning and require "gobs or remediation." Many students suffer from math anxiety and tons of kids are innumerate. Test scores are mediocre. Furthermore, kids are changing. As a result, the status quo does not work and we as teachers must teach differently than how we were taught. A little tweaking around the edges will not suffice. Finally, math for all is the worthy goal for today's classroom. The days of weeding-out are over. Being asked to help all kids succeed in mathematics is a daunting challenge, but one we must take to heart.

Steve then proceeded to present the top-down "solutions" thrown at educators. These include high stakes tests as part of NCLB, impossible benchmarks, and penalties for those who fall short.

What is lacking is a productive drive for reform that helps teachers meet today's challenges. Rather, the government seems to ignore instruction and implies that more of the same is fine—just "tamp it down slower, push it in harder and sprinkle it on finer."

Steve got passionate about math not being just about sorting kids. Nor is it just about preparing for Calculus. He maintains that Statistics is much more important for most students than Calculus. That is a talk for another evening perhaps...

The major crux of Steve's thesis then took shape. We

need bottom-up realistic solutions that are directly linked to changing teachers' pedagogy. This means re-examining what we teach and how we teach. This also means teachers need to transform in a way whereby beliefs and practices undergo sweeping changes. This means more than pulling out manipulatives, throwing kids in groups or asking a few open-ended questions. Rather, teachers must overhaul their thinking about what it means to know and understand mathematics, the kinds of tasks in which their students should be engaged, and finally, their own role in the classroom.

Steve offered some criticisms of what we teach. He poked fun at how U.S. elementary teachers typically teach subtraction with the borrowing algorithm. He posed the question $10.00 - 4.59$ to the audience. After a few moments, he elicited solutions. No one did borrowing. We tended to add on to 4.59 or used some other natural, conceptual approach. However, school children typically are taught crossing out zeros and a bunch of rules that make little sense to kids. We must teach multiple methods and offer multiple representations.

He then complained how much time is spent on long division. No one does this by hand anymore. It is more important to understand the conceptual underpinnings of division and to possess good estimation skills.

What is more important is to engage students in a higher-level discourse than algorithms that need to be mimicked. He gave an example of this for high school. Rather than simply have students learn the algebraic steps to solve $16x^{.75} < 1$ ask the following:

You ingest 16 mg of a controlled substance at 8 a.m. Your body metabolizes 25% of the substance every hour. Will you pass a 4 p.m. drug test that requires a level of less than 1 mg? At what time could you first pass the test?

Of course Steve does not advocate illegal drug-use! This is a legally prescribed substance. It should be noted that the multiplication of the 16 and the $.75x$ was "X." The crowd found this reprehensible and called him on it. Steve swiftly quit his slide show, edited the slide, and joked about how wonderful technology is. "When could one have made such a correction in the old days of transparencies?" Steve asked. John Benson commented he could have made such a change on a chalkboard! Steve returned to the algorithm of solving the exponential inequality in the traditional classroom. Students know to divide both sides by 16. Then they know something about logarithms and how God says the exponent can come down. The more important question is what is the mathematics we care about? Is it more important that students master the algorithm for solving (which can be easily done on a calculator) or the conceptual ability to set-up and apply mathematics to a situation that is real?

continue on page 4 . . .

Some Practical Strategies for Ensuring that No Teacher of Mathematics Is Left Behind

continued from page 3 . . .

So how do we make these changes when the dominant culture in the U.S. is one of professional isolation, blame (directed at kids, administrators, lawmakers, standardized tests, parents), and limited support for teachers (in terms of money, professional development, community)? At this point, Steve presented his blueprint for cultural change in the mathematics departments around the country. His blueprint involves little cost for schools. In stark contrast to the top-down approaches of NCLB, his blueprint focuses on the important work of teaching. He calls for a curriculum that is Standards-based. Equity must be fostered.

To do this, schools need resources, many of which are actually free. These include curriculum guides and frameworks, instructional materials, articles, classroom observations, demonstration classes, websites (www.learner.org, www.nctm.org/reflections, www.nctm.org/illuminations, www.mathforum.com, etc.), student work, common assessments, disaggregated scores, and collegial communities of teachers. Steve discussed the power of watching each other's lessons via videotape. One learns so much and it breaks down barriers so that teaching is not such an isolated activity.

Certainly, this is difficult to do and there are obstacles to change. Departments need to have confidence and the willingness to make change. They need to realize they own the curriculum, not the author of the textbook.

Steve apologized in his concluding remarks for giving such a "depressing talk", but it was nothing of the sort. Everyone I spoke with afterward found it a compelling call to action. We all enjoyed his humor, his energy, and his refreshing twist on No Child Left Behind. To insure that no student is left behind it is imperative that no teacher is left behind.

Real reform, Steve insists, entails sharing, supporting, and risk-taking. Look at the heroes after whom many of our schools are named (Washington, Jefferson, Lincoln). These individuals were great reformers. Each took tremendous risks and helped foster substantial, positive change. We as educators need to be heroes in our classrooms.

Special Offer for the 2006-2007 School Year "Buy 2, Get 1 Free!"

For this school year, 1st and 2nd year teachers who become members of MMC will receive their third meeting free when they come to two dinner meetings!

Take advantage of this tremendous opportunity to get involved with a great organization, hear top-notch speakers and meet fellow math teachers from throughout the Chicagoland area.

To participate, leave your name at the registration table
when you attend your first two meetings,
and your third meeting will be free!

Thanks to an anonymous MMC member for generously funding this program.

MMC Dinner Coupon

\$5 off a dinner for New Attendees

— or —

\$7 off a dinner for New Attendees

who join MMC

name _____ date used _____

Valid only at the MMC Meetings on
December 1, 2006 and January 19, 2007.
Expires January, 2007. Limit one (1) coupon per person.

Do you know of a senior at your school that would make a great math teacher?

Each year, MMC sponsors a \$1000 scholarship to a graduating high school senior who intends to become a mathematics teacher. A current member of MMC must sponsor applicants. In addition, two Filliman Scholarships will be awarded for the same amount (funded by a gift from the Fillimans). The application should be sent along with an official school transcript, a letter of recommendation from the sponsoring teacher, and an essay explaining why he or she wants to become a mathematics teacher. The application and guidelines are posted on the web site at www.mmcchicago.org. The winning student and his or her parents will be invited to the dinner meeting on May 11, 2007 to receive the award.

All materials are due by March 16, 2007 and should be sent to:

Phil Gartner
Glenbrook South High School
4000 W. Lake Ave
Glenview, IL 60026

MMC Membership and Change of Address Form

Mail to: MMC
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#2

Make check payable to MMC.

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Check preferred mailing address above.

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2007 T3 International Conference
 March 9-11, 2007
 Hyatt Regency Chicago
 For more information visit
education.ti.com/us/t3chicago

Save the Date!

USACAS 2007 will be held at Illinois Mathematics and
 Science Academy in Aurora, IL
 on June 16 - 17, 2007.
 Visit www.meeas.org for more information.
 Speaker applications are now being accepted online.

Don't Miss:

The MMC Conference of Workshops

Saturday, January 27th
 at Glenbrook North High School

NCTM Annual Meeting

Atlanta, Georgia
 March 21 - 24, 2007

If you would like a notice or reminder to appear in **POINTS AND ANGLES**, please email the text you would like to appear to kristenclegg@comcast.net no later than the date of the MMC meeting preceding the issue in which you would like it to appear. All notices are subject to editing.

Your membership renewal date appears in the upper right corner of the label.

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