Points & Angles

Conics, Cubics, Calculus, and CAS:
A Curious Connection and "The Most Marvelous Theorem in Mathematics"

June Speaker
Tom Dick

Special Location:

Friday, June 14, 2019
Dinner & Talk: 7:00 p.m.

Renaissance Chicago North Shore Hotel
933 Skokie Blvd., Northbrook, IL
$55 before May 23; $65 on or after May 23

Reservations required by Wednesday, June 5
Online only at dist113.revtrak.net/usacas#/list
*Payment required in advance with credit card only

MMC is cosponsoring the opening meeting for the USACAS Conference. This conference is focusing on technology in mathematics education. Some of the world's best experts have attended USACAS. The Friday night meeting will set a fantastic tone with a talk from Tom Dick. His talk is sure to be thought provoking and entertaining. Don't miss this wonderful opportunity. (Please note this special meeting takes place at the Renaissance Chicago North Shore Hotel in Northbrook and requires online payment prior to the event.)

Constraint-based dynamic geometry opens up new windows for exploring geometric figures, including conic sections. In contrast, computer algebra systems (CAS) are seldom thought of as being dynamic. Rather, a CAS is often considered a powerful "black box" for computing tedious symbolic calculations. In this presentation, we'll consider a special conic section, known as the Steiner ellipse, using constraint-based dynamic geometry. We'll then turn our attention to an exploration of cubic polynomials by taking advantage of dynamic computer algebra. There is a curious connection between these two explorations, which is truly remarkable and has been called the "most marvelous theorem in mathematics" by Dan Kalman. While the theorem was first discovered in the 1800s, it has received much recent attention over the last ten years. We'll use a marriage between dynamic geometry and CAS to illustrate the theorem, as well as a generalization, that is quite remarkable.

Tom Dick's Dinner Talk (cont.)

Tom Dick is a professor of mathematics at Oregon State University. His research interests include the study of factors related to mathematics achievement and participation, cognitive science as applied to the learning of advanced mathematics, uses of technology in the learning of mathematics, and mathematical discourse. He has worked extensively in the calculus curriculum reform movement. He has served on the joint AMS/MAA Committee on Research in Undergraduate Mathematics Education, the National Council of Teachers of Mathematics Research Advisory Committee, and the Advanced Placement Calculus Development Committee. He is a past co-editor of "Connecting Research to Teaching" for NCTM's *Mathematics Teacher* journal, associate editor for *School Science and Mathematics*, an editorial panel member for the *Journal for Research in Mathematics Education*, and an editorial panel member for the *Mathematics Teacher Educator*.

Points from the Interior
by Mary Wiltjer

As summer approaches, I again get excited. Yes, for the days off, but more so for the time to reflect deeply on my teaching. Summer affords me the chance to consider where I need to improve the most and what I can try to implement to do so. Summer offers me a chance to incorporate all I've learned at MMC this year. Annie Fetter's campaign to let kids Notice and Wonder is bouncing around in my head. I'm challenged by Eli Luberoff's encouragement to be sure we are using technology that encourages kids to think rather than think for them. I'm terrified Matt Moran's predictions about technology replacing teachers are making their way into education reality. I want time to find my favorite problems, some of which overlap with John Benson's, and see how they can inspire and propel my teaching to a higher level. I'm obsessed with *Catalyzing Change* (via Gail Burrill) and desperately want to help us shatter wrongly held myths and practices, such as tracking and speed testing, to bring on far more equity and access for all students in mathematics. And like Sheila Hardin, I am prepared to be a failure in front of my students in a quest to give all kids the chance to love and grow in mathematics as I have. Just thinking about this year's MMC impact on my teaching fills my summer.

I am so grateful to all the speakers and board members who helped make this a wonderful year at MMC. I'd love for us to find ways to increase our numbers so that more people can experience the specialness of MMC and therefore let it improve mathematics education in Chicagoland and beyond. Our purpose is an important one, so we must look to improve earnestly. I hope you all find ways to make your summer special as well.

May Dinner Meeting Talk – Annie Fetter
by Matthew Moran

Annie Fetter gave us a great deal to notice and wonder about at the most recent Friday dinner on May 10 at the Fountain Blue. In her talk, *Sense Making, Ideas, Curiosity and Learning*, Ms. Fetter demonstrated a classroom discussion technique called Notice and Wonder.

She started the presentation asking the audience to notice and wonder about a pattern of line segments. The pattern would be right at home in a pre-algebra or algebra I classroom, following a prompt to write a formula for the number of triangles or line segments at step n. This would be a good exercise in those settings, but that was not the task Annie had in mind. She instead wanted us to notice and wonder about the pattern. We were expected to share things we noticed about the pattern and express things that we wondered about the pattern.

Annie explained that as the students share the things they noticed and wondered, the teacher writes them down without praise or judgement of any kind. This detail is absolutely crucial to establishing the norms of the exercise. If a teacher reacts positively or negatively to something a student says, it can shut down other students or make them change their goal to say something to please the teacher, rather than to just notice and wonder.

Annie showed us a few examples from different classes where the noticings and wonderings were documented on large chart paper. She asked us to read them and discuss what grade level produced these ideas. There was a pretty wide range of suggestions from the crowd at Fountain Blue, but a rough consensus was fourth or fifth grade. We were fortunate enough to have some elementary school math teachers in the crowd, including a kindergarten teacher who suggested the ideas were produced by students as young as kindergarten or first grade. Annie confirmed that both examples were from kindergarten through second grade. She made the point that our students know a lot more math than we think they do, and even very young children have some pretty sophisticated ideas when asked to notice and wonder.

Annie really emphasized that the classroom should be centered around the student experience, not the teacher experience. Classroom dynamics are often a teacher explaining most of the ideas with students only given opportunities to fill in small blanks the teacher allows. Given how much math students know, allowing more opportunities for students to contribute their thoughts makes for a more robust learning environment.

Fetter also discussed curiosity and the role it should have in the classroom. She posited that people can't understand solutions to problems that they don't have. Her argument included a discussion of her cousin Frank who never really learned much in school but recognized his love of learning in adulthood. A classroom where students have more agency and care about the solutions to the problems they are working on provides opportunities for students like Frank to explore their natural curiosities. Annie also shared a few examples about sense making, again relating stories from her family. One such story was about helping her husband construct a lesson to help first graders learn the card game, SET. While he was thinking about the best way to explain the rules so that first graders would understand, she had a different approach. Her idea was to lay the

Annie Fetter's Dinner Meeting Talk (cont.)

cards out and let the students notice and wonder their way to the rules of the game. She conceded that this takes a bit of leading to actually get the students to the rules of a game like this, but the approach is an effective one. Her husband admitted that doing it his way would have likely not gone as well.

Annie Fetter finished her talk by emphasizing the student experience with a quote from John Dewey, "Give the pupils something to do, not something to learn; and the doing is of such a nature as to demand thinking; learning naturally results." Notice and Wonder is surely not the only way to invite students to think and explore ideas they are interested in, but it is a simple, repeatable method that can be incorporated on a daily basis. This regular expectation for students to ask their own questions could really change the dynamics in a typical classroom from one where students are answering a textbook author's questions to one where they are making sense of the world around them and exploring their own interests and curiosities.

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USACAS 2019

Extending Math Education with CAS and Other Technology Tools
Attend the ELEVENTH INTERNATIONAL Expanded Technology Conference
Organized by MEECAS
(Mathematics Educators Exploring Computer Algebra Systems)

WHERE: Highland Park High School, Highland Park, IL
WHEN: Saturday, June 15, 2019 8:00 AM - 3:30 PM
  Sunday, June 16, 2019   8:00 AM - 1:00 PM

Opening Dinner: Friday, June 14, 2019; co-hosted by MMC at the Renaissance Chicago North Shore Hotel

Up to date information is posted at usacas.org.

Registration: **$100 for USACAS 11**
  $110 for USACAS 11 AND the MMC Friday night dinner
  $65 for MMC Friday night dinner
  (Fee includes continental breakfast, box lunch, and snacks.)

Optional Saturday evening dinner and Architectural Boat Tour--transportation is included: $55
Deadline to register for the outing is Wednesday, May 22!

IMPORTANT NOTE ABOUT THE MMC DINNER RESERVATIONS:
REGISTRATION DEADLINE for the MMC dinner or the combination
USACAS 11/MMC dinner is **WEDNESDAY, June 5.** PAYMENT must be made
at the time of registration. **Registration is ONLINE only with a CREDIT CARD.**

NEW! Graduate credit will be available through Central Michigan University.
NEW! Professional Development Hours will be available for Illinois teachers.

Please submit your registration using our direct link: https://dist113.revtrak.net/usacas#/list.

Any questions can be directed to Ilene Hamilton at ihamilton2341@gmail.com.

Congratulations to the Scholarship Winners for 2019!

Katherine Kochendorfer of Oak Park River Forest High School is the winner of the MMC Scholarship funded by member donations. She was nominated by Joyce Gajda. In addition to mathematics, Katherine enjoys dance and music. Her experiences in tutoring and mentoring have been rewarding and left her with a passion for helping others learn mathematics. Katie mentored freshmen who were struggling with math on a weekly basis.

Martin Kaeb of Prairie Central High School is one of the winners of the Filliman Scholarship. He was nominated by Darl Rassi. Martin is very active doing service work with his youth group in addition to NHS and the Engineering Club. He had the opportunity to intern with his teacher, Rebecca Shafer, and gain experience by assisting in developing materials for a freshmen course. He worked with those same students in their study halls.

Alyssa Mages of Glenbrook North High School is one of the winners of the Filliman Scholarship. She was nominated by Scott Knapp. Alyssa is active in music, dance, NHS, and the Thespian Society. Alyssa took part in a teaching internship and taught a math lesson to 3rd graders in addition to working regularly with preschoolers. In her teaching experiences, Alyssa learned about bringing energy into her lessons and keeping students engaged.

SAVE THE DATE
The MMC Conference of Workshops!

Saturday, February 1, 2020
at Stevenson High School
Lincolnshire, IL

Please consider being a presenter for 2020 or
presenting with a co-speaker.

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Upcoming Events

Fri., June 14 : Tom Dick	**Conics, Cubics, Calculus and CAS: A Curious Connection and "The Most Marvelous Theorem in Mathematics!"**
Sat.-Sun., June 15-16	**USACAS Conference, Highland Park**
Sat., February 1, 2020	**MMC Conference of Workshops, Lincolnshire**
Wed.-Sat., April 1-4, 2020	**NCTM Centennial Annual Meeting: Celebrating 100 Years—Looking Back and Moving Forward, Chicago**

Send upcoming event items to sburnett_308@yahoo.com no later than the date of the MMC dinner meeting preceding the issue in which the item should appear. All items are subject to editing.

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

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