Spring 2021 Meeting of the Nebraska/Southeast South Dakota Section of the MAA
April 10, 2021
Virtual Meeting Hosted by Hastings College

Conference Registration

Please register by entering your information in this Google Sheets spreadsheet.

Keynote Speaker - Dr. Jennifer Quinn

Jennifer Quinn is a professor of mathematics at the University of Washington Tacoma. She earned her BA, MS, and PhD from Williams College, the University of Illinois at Chicago, and the University of Wisconsin, respectively. Her first academic position was at Occidental College, where she rose through the ranks to full professor and chaired the department. At UW Tacoma, she has helped build a mathematics curriculum on the expanding campus, served four years as Associate Director for Interdisciplinary Arts & Sciences, and stepped in as Interim Associate Vice Chancellor for Academic Affairs when needed.

Committed to making mathematics accessible, appreciated, and humane, Quinn serves on the STEAM Learning Collaborative Action Network, part of the Foundation for Tacoma Students, whose goal is to expand interest, experience, and success in science, technology, engineering, arts, and mathematics for all Tacoma students—particularly girls, students of color, and those impacted by poverty. During the pandemic, the #TacomaMath workgroup of the STEAM Learning network created grade-specific math quests (electronic and printed) and chalked puzzles outdoors to create a culture of love for math in the community. Also in response to the pandemic, Quinn began the blog Math in the Time of Corona, where she chronicles her experiences on emergency remote teaching of mathematics, maintaining humanity, and building community in isolation.

Quinn has held many positions of national leadership in mathematics, including being the current MAA President. She has previously been the Executive Director of the Association for Women in Mathematics and previously held these positions in the MAA: co-editor of *Math Horizons*, Second Vice President, Chair of the Council on Publications, and Officer-at-Large on the Board of Directors. She received a 2007 Haimo Award for Distinguished College or University Teaching and a 2006 Beckenbach Book award for *Proofs That Really Count: The Art of Combinatorial Proof*, co-authored with Arthur Benjamin. As a combinatorial scholar, Jenny thinks that beautiful proofs are as much art as science. Simplicity, elegance, transparency, and *fun* should be the driving principles. She strives to bring this same ethic to her classroom, administrative work, and professional service.

Keynote Talk: Saturday, April 10, 1:15 – 2:15 pm

Belonging in Mathematics

Abstract: Who gets to call themself a mathematician? Do you? Inspired by the work of #TacomaMath and @traciteacher to bring mathematical thinking to their communities, this presentation explores a definition of mathematician and creative puzzles to encourage diverse thinking. By the conclusion, I hope to convince you that we all belong.

Links:

Zoom links for the organized meeting activities:

If you have not done so already, it is recommended that you download and install the Zoom client application from the Zoom download page before the meeting begins.

Main Session: NeSESD 2021 Section Meeting Main Session

https://maa.zoom.us/j/95045558838?pwd=T3c1Ykd5U1RtRUJnWnB4c2tLdjFlQT09

Meeting ID: 950 4555 8838

Passcode: 280881

One tap mobile

+16699006833,,95045558838# US (San Jose)

Parallel Morning Session: NeSESD 2021 Section Meeting Parallel Morning Session

https://maa.zoom.us/j/94740376447?pwd=b1lzMEtxTkUzdGowVmxGZVhPaDc3Zz09

Meeting ID: 947 4037 6447

Passcode: 485924

One tap mobile

+16699006833,,94740376447# US (San Jose)

SINE COMMIT Informal Lunch Discussion (Gather.Town):

https://gather.town/app/TycQFUmcCiTaGb9x/x+y

Spaces for Socializing (open throughout the meeting)**:**

In Google Meet: https://meet.google.com/trh-kknv-our?hs=122&authuser=0

In Gather.Town: https://gather.town/app/WmLMnxs1pmYiORsb/NeSESD_Social_Space
(experimental, 25 simultaneous residents maximum; many thanks to Patrick Rault for introducing me to Gather.Town)

Saturday, April 10 **Morning Session** **Zoom:** Main Session

10:00 am – 10:30 am	**Section Business Meeting**
10:30 am – 10:40 am	**Break**
10:40 am – 10:45 am	**Greeting from Dr. Barbara Sunderman** – Vice President for Academic Affairs at Hastings College.
10:45 am – 12:10 pm	**Contributed Talks, Morning Session:**
10:45 am – 11:05 am	**Neural Networks and Graph Theory** ***Ally Larsen***, Creighton University (Student) **Abstract:** Biological occurrences such as food webs, disease spread, and neural activity consist of a chain of events or signals and can therefore be represented using graphs. This project will focus specifically on modeling neural activity of the brain using graphs. Our goal is to mathematically explore how neural structure and processes affect the firing rate of neurons in a neural network. More specifically, we will simulate neural activity using three distinct types of directed graphs. For each type of graph, we will explore how structure affects the average firing rate of neurons. Then we will make adjustments to our graphs that mimic the behavior of neurons within the brain. For instance, we will create models that have inhibitory neurons and differing refractory periods. We will then mathematically determine how these factors impact the average firing rate of neurons. Finally, we will acquire actual neurological data and determine which model most accurately represents it.
11:05 am – 11:25 am	**Persistent Homology Project Talk** ***Jenna Royce***, Creighton University (Student) **Abstract:** Persistent homology is a tool used to study qualitative features of data over a variety of size scales. The primary goal of this tool is to identify noise within high-dimensional data sets. It has various real-life applications and is currently a method used to help analyze data sets. Previous authors have used persistent homology to construct a distance function between data sets. The definition for distance they present utilizes sup norms. Our goal is to establish distance utilizing other norms to establish different definitions of distance. From there these models can be compared for accuracy by setting a true distance and comparing the other models to this, giving us the accuracy of our models.
11:25 am – 12:10 pm	**Panel Discussion: Reflections from engaging students during a pandemic** **Panel:** ***Dr. Su Dorée,*** Augsburg University (Department Chair) ***Dr. Rachel Neurath***, Metro Community College (Mathematics Department Coordinator) ***Dr. Patrick X. Rault***, University of Nebraska at Omaha **Moderator:** ***Dr. Michael T. Keller***, Morningside College **Abstract:** This panel will focus on successes and challenges involved in engaging students through online, remote instruction, and other nontraditional instruction methodologies. The discussion will focus on what we will keep in our educational repertoires once the pandemic is behind us. This discussion is hosted by the South (D)akota, Iowa, and NEbraska COMmunity for Mathematics Inquiry in Teaching (SINE COMMIT). SINE COMMIT will host a space for informal discussion over lunch, at the Gather.Town room SINE COMMIT informal lunch discussion.

Saturday, April 10 **Parallel Morning Session** **Zoom:** Parallel Morning Session

10:45 am – 11:05 am	**Generating Problems and Conjectures with GeoGebra** ***Dr. José Contreras***, Ball State University **Abstract:** In this presentation, I will illustrate how my students and I have used a problem-posing framework and GeoGebra to formulate problems and conjectures related to the Varignon problems using four main strategies: Specializing, generalizing, extending, and reversing. To enrich the students' experience, I start the investigation with the following version of the Varignon's problem: Let E, F, G, and H be the midpoints of the consecutive sides of a parallelogram ABCD. What type of quadrilateral is EFGH?
11:05 am – 11:25 am	**Using quaternions to prove theorems in spherical geometry** ***Dr. Marshall Whittlesey***, California State University San Marcos **Abstract:** It is well known that the complex numbers can be used to do transformation geometry in the plane. It is less well known that the quaternion algebra (consisting of expressions of the form $a+bi+cj+dk$ with $i^2=j^2=k^2=-1$) can be used to do similar transformations in three dimensional space. In this talk we show how to use quaternions to prove an interesting classical theorem in spherical geometry. These methods are featured in the speaker's new book with CRC Press, *Spherical Geometry and its Applications,* which the author hopes will be attractive for use in topics courses in geometry.
11:25 am– 11:45 am	**Generalization Theory of Linear Algebra III** ***Christina Pospisil***, University of Massachusetts Boston (Student) **Abstract:** This talk continues the previous presentations Generalization Theory of Linear Algebra I+II from the JMM 2019 and JMM 2020 Conferences (Part I was also presented at the NE/SESD Section Meeting in 2019). In the first part an algorithm for multiplying and adding matrices regardless of dimension via an embedding, and inverses for non-injective mappings in one dimension, were presented. The second part presented inverses for non-injective mappings in multiple dimensions, inverses for non-surjective mappings in one and multiple dimensions, and a general determinant theory. This third part is dedicated to a further generalization regarding tensors, together with first applications in physics. In future work further operations and applications to physics and other natural sciences will be explored.

Lunch Break: 12:10 pm – 1:10 pm

All attendees are invited to join the

SINE COMMIT informal lunch discussion

or one of the meeting's socializing spaces,

Google Meet chat

Gather.Town room

Saturday, April 10 **Afternoon Session** **Zoom:** Main Session

1:10 pm – 2:10 pm	**Belonging in Mathematics** **Keynote Speaker:** ***Dr. Jennifer Quinn***, University of Washington Tacoma
2:10 pm – 2:20 pm	**Break**
2:20 pm – 3:20 pm	**Contributed Talks, Afternoon Session:**
2:20 pm – 2:40 pm	**Reorganizing Calculus: Getting Students Ready for the Future** ***Dr. Margaret Watts and Dr. Barbara Jennings Herzog***, Doane University **Abstract:** Last year, Doane University replaced Calculus II with a course that combines Differential Equations and some of the concepts from Calculus II. The main goal is to introduce modeling earlier in the curriculum. In this talk, we will discuss the motivation, the topics covered, and the things we have learned.
2:40 pm – 3:00 pm	**Problem Solving: Focusing on Communication and Perseverance** ***Dr. Kristopher Williams, Dr. Margaret Watts, and Dr. Barbara Jennings Herzog***, Doane University **Abstract:** Problem Solving is one of Doane University's general education classes. The course is organized around strategies, and solutions must adhere to a format based on Polya's four step approach. A culture is developed within the class that fosters student engagement, communication, teamwork, and perseverance. In this talk, we will discuss the motivation and structure of the course, the homework system, and feedback from students.
3:00 pm – 3:20 pm	**Find the Mistake: Error Analysis in College Math to Promote Critical Thinking** ***Dr. Margaret Adams,*** South Georgia State College **Abstract:** Students in pre-calculus were given worked out solutions to problems that contained mistakes. The mission was to identify the mistakes, if any, and offer appropriate corrections. As an extension to this, students had to create a problem of their own that contained one or more mistakes and had to share it with others for feedback in an online discussion post. Either PDF files or pictures of their solutions or PDF files were posted. Examples of original tasks and students' written responses identifying mistakes are provided with results discussed within the contextual framework of Marzano's New Taxonomy.
3:20 pm – 3:30 pm	**Break**
3:30 pm – 4:00 pm	**Section Officers Meeting**