The **Department of Mathematics** at **Francis Marion University**

welcomes you to the

2018 Francis Marion Undergraduate Mathematics Conference

Friday, April 6, 2018

— Schedule —

12:30 *p.m.* **Registration begins**. Lobby, Lee Nursing Building.

Snack provided by Conference in the lobby, please enjoy at your leisure until 3pm.

12:55 *p.m.* **Welcome and Announcements.** Auditorium.

1:00 *p.m.* **Math Jeopardy!** Auditorium.

2:00 *p.m.* **Mingle and Post!** Lobby. Grab a snack, network with students and faculty and participate in the photo scavenger hunt (directions included in packet).

2:20 *p.m.* **Student Presentations Begin** Classrooms 205 and 214.

Schedule of talks and abstracts are included in packet.

4:30 *p.m.* **Keynote Address,** Auditorium.

Dr. Kristen Kobylus Abernathy, **Associate Professor, Winthrop University,**

Modeling Drug Resistant vs. Sensitive Tumor Cell Dynamics.

Drug resistance, also known as multidrug resistance (MDR), is the leading cause of chemotherapy failure in treating cancer. This drug resistance in cancer cells can be transferred from resistant cancer cells to sensitive cancer cells. Sensitive cancer cells can become resistant through three main methods: direct cell to cell contact with resistant cancer cells, through a membrane, or through exposure to the treatment drug. In this talk, we begin by exploring how systems of ordinary differential equations can help us better understand cancer dynamics. From there, we construct a system that models the transfer of drug resistance from resistant to sensitive cancer cells via direct cell to cell contact. We then introduce an immune response and chemotherapy, and establish conditions on treatment parameters in the resulting system to ensure a globally stable cure state. We conclude with evidence of a limit cycle, conjecture the existence of a Hopf bifurcation, and discuss future work.

5:30 *p.m.* **Student Presenter Recognition, Closing Remarks and Conference Picture**

— Website —

http://www.fmarion.edu/mathematics/activitiesandevents/#FMUMC

Student Talk Schedule

	LNB Room 205	LNB Room 214
2:20-2:35	*The History and Mathematical Properties of Pascal's Triangle* Kaitlyn Lowry Francis Marion University	*Optimizing the FMU Baseball Team's Batting Lineup Using Markov Chains* Katherine Floyd Francis Marion University
2:40-2:55	*Properties of Fibonacci and Lucas Matrices* Hsin-Yun Ching The Citadel	*ARCH and GARCH Modeling for Volatility in the Stock Market* Yaping Yang Francis Marion University
3:00-3:15	*A Fibonacci Identity* Elizabeth Spoehel The Citadel	*Characterization of Polar Plots* April Garrity Francis Marion University
3:20-3:35	*The Relationship Between Mathematics and Agriculture Through History* Victoria Hicks Francis Marion University	*Linear Algebra and Local Extremes* Alex Foster Coastal Carolina University
3:40-3:55	*Ramsey Numbers* Eric Zhang Coastal Carolina University	*Maxwell's Equations and Electromagnetic Waves* Nicholas Tomlinson Francis Marion University
4:00-4:15	*The Introduction of Zero* Salomé Chavez Francis Marion University	

Student Talk Abstracts

Salomé Chavez, Francis Marion University
The Introduction of Zero

When mathematics was first discovered, it was used for practical purposes; as time went on, the needs of society became more complex and so did the maths. This presented a need for a symbol to represent "nothing," and so zero was born. This talk explores what was being used before a symbol was needed, how the concept of zero was established, what the concept of zero is, and its worldwide path.

Hsin-Yun Ching, The Citadel
Properties of Fibonacci and Lucas Matrices

In this presentation, I will show the solution of a problem that I solved from Fibonacci Quarterly. The problem was to find the solution of a system of linear equations with Fibonacci coefficients. I solved this problem using the result of another problem -that I solved last year- from the same journal. I also used linear algebraic techniques like matrix block multiplication to solve the problem.

Katherine Floyd, Francis Marion University
Optimizing the FMU Baseball Team's Batting Lineup Using Markov Chains

Markov Chains can be used to optimize a sequence using probability and statistical methods. This method allows players of different physical abilities to be considered, and ultimately determines the optimal sequence of batting order to maximize performance. This method will be applied to the Francis Marion University's baseball team players.

Alex Foster, Coastal Carolina University
Linear Algebra and Local Extremes

In this talk a linear algebra approach is used to prove the classical Second Derivatives Test for finding local extremes. The main idea is that a surface can be thought of as a conglomeration of curves each associated with a linear combination of eigenvectors. The concavity of these individual curves can be linked to the determinant of the Hessian matrix to prove the result.

April Garrity, Francis Marion University
Characterization of Polar Plots

Parameters of functions with the form $r \sin\theta$ will be varied and their influence on the plot structure will be described.

Student Talk Abstracts

Victoria Hicks, Francis Marion University
The Relationship Between Mathematics and Agriculture Through History

Farming is thousands of years old and the techniques have advanced throughout history due to the advancement of mathematics. This presentation will highlight problems from the Rhind Papyrus and the Moscow Mathematical Papyrus that illustrates how the Ancient Egyptians solved mathematical problems to help with areas in farming.

Kaitlyn Lowry, Francis Marion University
The History and Mathematical Properties of Pascal's Triangle

Pascal's Triangle is a triangular arrangement of numbers that embeds multiple mathematical properties and patterns. This presentation will highlight the general structure of Pascal's Triangle, the work of some early contributors, and mathematical properties of the triangle. The relationship between Pascal's Triangle and the powers of 11, Fibonacci sequence and probability will be discussed.

Elizabeth Spoehel, The Citadel
A Fibonacci Identity

In this presentation I talk about the solution of Problem B-1218 from Fibonacci Quarterly. I will show the solution of this problem in detail and speak on the process. This problem has been submitted for publication to the same journal.

Nicholas Tomlinson, Francis Marion University
Maxwell's Equations and Electromagnetic Waves

Maxwell's equations are fundamental to describing both electric and magnetic fields. They can be represented in both differential and integral forms. The mathematics of Maxwell's equations consists primarily of vector operations and multivariable calculus.

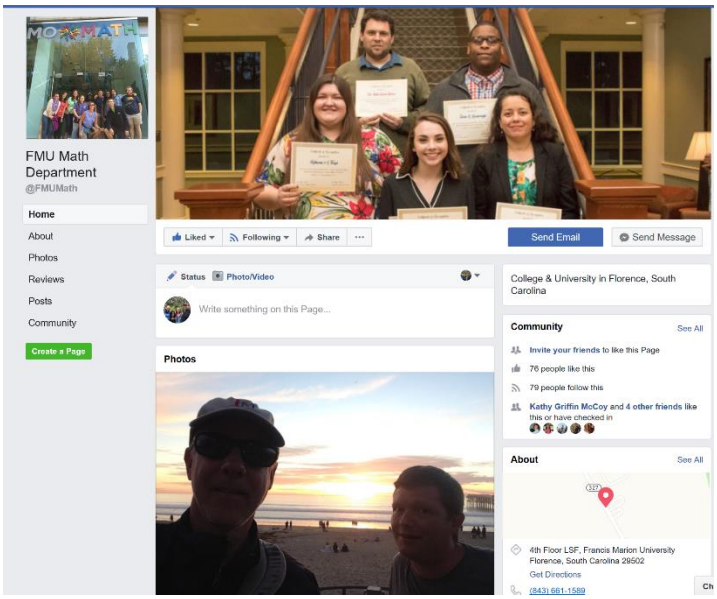
Yaping Yang, Francis Marion University
ARCH and GARCH Modeling for Volatility in the Stock Market

In general, the return of securities is today's return over yesterday's return. In forecasting for future returns, financial time series modeling such as ARCH and GARCH can be employed for the time-varying volatility clustering. In this talk, we will discuss aspects related to this model.

Student Talk Abstracts

Eric Zhang, Coastal Carolina University
Ramsey Numbers

In this talk we will prove that R(4,3) = 9. That is, any complete graph with 10 vertices whose edges are colored either red or blue must contain a complete subgraph of 4 vertices all of whose edges or red OR a complete subgraph of 3 vertices all of whose edges are blue. It is straightforward to obtain R(4,3) < 11, but a wonderful parity argument shows that R(4,3) < 10.



Get Social!

#FMUMC2018 @fmumath

Post about the conference using the **#FMUMC2018**. Your photos could earn you a prize by participating in our photo scavenger hunt. The top two social networkers who post the most and best pictures to the categories below will win. Only posts on Facebook and Twitter will be considered. Each photo must have the hashtag (so we can find it!) and a caption describing the category the photo satisfies. One category per photo, please. Start posting!

- Pose for a group photo with students from your school.
- Snap a selfie with a faculty member.
- Take a photo of yourself with a student from a different school.
- Take a selfie with a student speaker.
- Take a photo with something that inspires you.
- Take a selfie with the General.
- Pose for a snap with our conference poster.
- Snap your best mathematician pose.