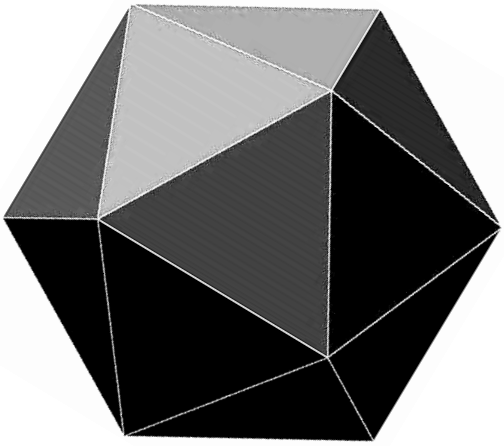
2021 Joint Meetings
Of The
Florida Section
Of The
Mathematical Association of America
And
The Florida Two-Year College Mathematics Association



Virtual Meeting

February 19-20, 2021

Florida Section of the Mathematical Association of America

2020 – 2021

Section Representative	Monika Kiss, Saint Leo University
President	Milé Krajčevski, University of South Florida
Past President	Altay Özgener, State College of Florida
Vice-President for Programs	Monika Kiss, Saint Leo University
Vice-President for Site Selection	Julie Phelps, Valencia College – East Campus
Secretary-Treasurer	Sidra Van De Car, Valencia College
Newsletter Editor	Daniela Genova, University of North Florida
Coordinator of Student Activities	Kevin Murphy, Saint Leo University
Webmaster	Altay Özgener, State College of Florida
President-elect	Anthony Okafor, West Florida University
VP for Programs-elect	Jacob Aguilar, Saint Leo University
VP for Site Selection-elect	Sean Murphy, Eckerd College

Florida Two-Year College Mathematics Association

2020-2021

President	Joni Pirnot, State College of Florida
Past President	Sandra Seifert, Florida SouthWestern State College
Vice-President for Programs	Don Ransford, Florida SouthWestern State College
Secretary	Sidra Van De Car, Valencia College
Treasurer	Ryan Kasha, Valencia College
Newsletter Editor	Rebecca Williams, State College of Florida
Membership Chair	Dennis Runde, State College of Florida
Webmaster	Altay Özgener, State College of Florida
President-elect	Sybil Brown, Lake-Sumter State College
Historian	Robert Shollar, State College of Florida

PROGRAM

Friday, February 19, 2020

Committee Meetings and Workshops

FL – MAA

11:00 – 1:00 Executive Committee Meeting *Room 7*

FTYCMA

1:00 – 2:45 FTYCMA Officer's Meeting and

FTYCMA Annual Business Meeting *Room 7*

WELCOME

2:45 – 2:55 **Welcoming Remarks** *Room 1*

Joni Pirnot, President, FTYCMA
Milé Krajčevski, President, FL-MAA

Please note that for the duration of the conference we created *Room 12* as a room where you can meet up with old friends and make new friends, if you wanted to take a short break. We also created Room 11 for students to mingle. Enjoy the Conference in this new and virtual way!

Friday, February 19, 2020

3:00 – 3:50 Plenary Session *Room 1*

Jennifer Quinn – President of Mathematical Association of America

Digraphs and Determinants: Determinants through Determined Ants

4:00 – 4:45 Contributed Papers Session I

James A. Condor *– State College of Florida* *Room 1*

Are Mathematicians or Artists Driving the Future of Visual Design?

Jerry Tuttle *– Rocky Mountain College of Art & Design* *Room 2*

What is Data Science?

Anurag Katyal *– Palm Beach State College* *Room 3*

Increasing Engagement in the Virtual Classroom with Itempool

Jacci White and Monika Kiss *- Saint Leo University* *Room 4*

Teaching Intermediate Algebra during the Pandemic

Nkosi Alexander-Williams *- University of North Florida* *Room 5*

Bitangency Reconstruction

Gary Marmon, Matthew Kimm, Brian Le, Jay Kim, and

Anthony Okafor *- University of West Florida* *Room 5*

Machine Learning Techniques and Applications to Higher Education: Student Dropout

Jenna Bradley and Daniela Genova*– University of North Florida and*
Joseph Ours *– State College of Florida* *Room 6*

Making Math Personal

5:00 – 5:45 Contributed Papers Session II

Marshall Whittlesey *- California State University San Marcos* *Room 1*

Proving theorems in spherical geometry using the quaternions

Jacob Aguilar*- Saint Leo University* *Room 2*

Modeling Asymptomatic Carriers in the COVID-19 Pandemic

Gregory McColm *– University of South Florida* *Room 2*

The Geometry of Finding Your Way

Adebukola Adeyemi, Carrie E. A. Grant and Kurt Sebastian *– Flagler College* *Room 3*

The Effects of Distance Learning

Maggie Swanson and Menaka Navaratna *–*
Florida Gulf Coast University *Room 4*

Implementation of Rapid Paired Classes (RPC) in lower-level math classes to improve DFW Rates

Stephanie Branham *– University of Tampa* *Room 4*

Maintaining Academic Integrity in an Online Environment

Graham Neitstel *– Florida Institute of Technology* *Room 5*

Last Exits of 2D Renewal-Reward Processes

Brendan Chamberlain *– University of North Florida* *Room 5*

Location Numbers of Graphs

Ryan White – *Florida Institute of Technology* *Room 6*

Exiting Patterns of Multivariate Renewal-Reward Processes

4:00 – 6:30 **Student Events** *Room 10*

In order to be considered for award recognition in the Integration Contest/Problem Solving contest you will need to print out the contest and have your camera on and aimed at your workspace. Your camera must be far enough away that both arms are visible for the duration of the contest. Once you have completed the exam, you will need to use a document scanning app (like CamScanner) to scan your solutions and email your completed submission to Kevin Murphy (Kevin.Murphy@saintleo.edu) within 10 minutes of the closure of the contest. Any submissions received after these 10 minutes have passed will not be deemed eligible.

4:00- 4:50 *Student Integration Contest*

Come test your integration abilities!

5:00 – 5:50 *Student Problem Solving*

Attempt to solve some fun problems.

6:00 – 6:30 *Student Kahoot" Contest*
Students test their ability to quickly answer questions.

Please note that we are using *Room 11* as our Student Hospitality "room". Feel free to come and join other students in here.

6:00 – 6:45 **Section Representative's Session** *Room 1*

Monika Kiss *- Saint Leo University*

What can the MAA do for you and what can you do for the MAA?

McGraw Hill Presentation *Room 2*

Holly Dickin & LaMar Hester - *Ball State Univeristy and Florida ALEKS Specialist*

The ALEKS Advantage for Today's Students

How ALEKS helps students in course preparedness and increases real learning and assists instructors to prepare their course format their way: hybrid, online, face to face and corequsites.

7:00 – 8:00 **Plenary speaker** *Room 1*

J. Brian Conrey - American Institute of Mathematics

Everyday Intransitivity

Good night and see you in the morning!

Saturday, February 20, 2021

7:45 – 7:55 **Welcome back** *Room 1*

8:00 – 8:45 **Contributed Papers Session III**

***Reid Ginoza**, Anthony Okafor-University of West Florida* *Room 1*
***Joseph Maestas** - Applied Research Associates, Emerald Coast Division*
***D. Barrett Hardin** - Air Force Research Laboratory, Munitions Directorate*
***Matthew Clay**- Air Force Research Laboratory, Munitions Directorate*

Semiparametric Models for Unreacted Equations of State in Modeling Detonation of High Explosives

***Mohammad Rahman** – University of North Florida* *Room 2*

Impact of noise in the wave propagation in theta-dot network arises in mathematical neurosciences

***Lei Hsin Kuo -** University of West Florida* *Room 3*

RBFs Approximation with Ghost Points Optimization

***Jia Liu** – University of West Florida* *Room 3*

A clustering technique for the Community Detection using Radial Basis Functions

***Mihhail Berezovski** – Embry Riddle Aeronautical University* *Room 4*

Data-driven undergraduate research projects with business, industry, and government

***Dennis Runde –** State College of Florida, Manatee and Sarasota* *Room 5*

How Many Points is that Worth? Assessing Problem Solving with Rubrics

***Jenna Bradley and Daniela Genova**– University of North Florida and*
***Joseph Ours** – State College of Florida* *Room 6*

Making Math Personal

Gary Marmon**, **Matthew Kimm, Brian Le, Jay Kim, and

***Anthony Okafor** - University of West Florida* *Room 6*

Machine Learning Techniques and Applications to Higher Education: Student Dropout

9:00 – 9:45 Contributed Papers Session IV

Anthony Okafor**, **Josaphat Uvah, Brian Le, and

***Jay Kim** – University of West Florida* *Room 1*

Who Is Most Likely at Risk of Underperforming in Their First Term: Discovering Interest Rules among FTIC

***Lubomir Markov** – Barry University* *Room 2*

In Euler's footsteps: some results related to ζ(2) and ζ(3)

***Scott Demsky** – Broward College* *Room 2*

Classifying the reflection and stretching of the reciprocal function

***Lindsey Fox** – Eckerd College* *Room 3*

Promoting Diversity, Equity, and Inclusion in the Mathematics Classroom: Student Presentations on Historical Mathematicians from Underrepresented Identities

***Matthew Rudy Meangru** - University of East Anglia* *Room 3*

Exploring Undergraduate Student Engagement in a Virtual Developmental Mathematics Course through Mathematical Modelling Activities and 3D Modelling

***Lisa Cohen and Anurag Katyal** –*

Valencia College & Palm Beach State College *Room 4*

Increasing homework access and improving outcomes through collaboration - one course at a time.

***Caitlin Walsh** – Saint Leo University* *Room 5*

Math Anxiety: You Are Not Alone

Madyson Woodburn, Alyssa Bernstein and
Lindsey Fox– *Eckerd College* *Room 5*

Mathematically Modeling the Transmission of COVID-19 at Eckerd College

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9:00 – 9:50 *Student Integration Contest*

Come test your integration abilities! *Room 6*

10:00 – 10:45 Contributed Papers Session V

Jay Kim, Matthew Kimm, Gary Marmon, and
Anthony Okafor - *University of West Florida* *Room 1*

Who Will Leave or Who Will Stay? Associating FTIC Admissions Data with Atypical APR Performance Using Apriori Algorithm

Matthew Kimm, Gary Marmon, Jay Kim and
Anthony Okafor- *University of West Florida* *Room1*

Applications of Webpage Ranking to Course Difficulty and Recommendation

Donald McGinn - *University of West Florida* *Room 2*

Pell-type equations and near-square primes

Adriane Griffith, Paula Collado Cordon,
and Veronica Schlauri Quezada – *Rollins College* *Room 2*

Analysis of COVID-19's Impact Among College Students in a Suburban Community

Daniel Jelsovsky and Susan Serrano – *Florida Southern College* *Room 3*

Introducing an Applied Math Major At a Small Liberal Arts College

Milé Krajčevski – *University of South Florida* *Room 3*

The role of visualization in undergraduate mathematics

Kevin Murphy – *Saint Leo University* *Room 4*

Using Kahoot! to Improve Participation in a General Education Mathematics Course

Shreya Bose *– Florida State University* *Room 4*

Kyle-Back models with risk aversion and non-Gaussian beliefs

Laura Babiceanu and Darryl Chamberlain Jr *–*
University of Florida *Room 5*

Analyzing student achievement with residential and online students in College Algebra

Kate Johnson & Paul Johnson *– University of California Davis* *Room 5*

Hailstone Numbers, Stopping Lengths and the Collatz Conjecture

11:00 – 11:50 **Plenary Session** *Room 1*

Donal O'Shea *- President of New College of Florida*

Polynomial Knots

12:00 – 1:30 **Closing Remarks** *Room 1*

Joni Pirnot, President, FTYCMA
Milé Krajčevski, President, FL-MAA

Award Ceremony and
FL-MAA Business Meeting

ABSTRACTS

Contributed Papers Session I

James A. Condor – *State College of Florida*

Are Mathematicians or Artists Driving the Future of Visual Design?

The presentation looks at the history of the math/art connection and how interdisciplinary efforts have changed the landscape of art education. Mathematics and Visual Design are opening new pathways for creating the visual arts of the future.

Jerry Tuttle – *Rocky Mountain College of Art & Design*

What is Data Science?

Your 2021 vision for the future has to include data science. It's a fast growing career, and more and more schools are offering courses and degrees. Data science has been described as the Venn Diagram intersection among Math/Statistics, Computer Science, and Subject Matter Knowledge. The audience will explore some simple datasets manually that lend itself to data science, and the speaker will discuss some popular data science algorithms. The speaker is a retired actuary.

Anurag Katyal – *Palm Beach State College*

Increasing Engagement in the Virtual Classroom with Itempool

Do I *have* to turn on my webcam? My mic doesn't work so I won't be able to answer any questions - is that ok? Do you hear these questions frequently? Do you spend your Zoom meetings starting at blank screens or ceiling fans wondering if anyone is there on the other side of the great virtual divide? Itempool doesn't fix these issues or answer those questions but it does provide a free, innovative way of engaging students and getting immediate feedback with a fresh take on boring, static polls. You can speed up or slow down in class and even add Itempool to previously created instructional videos. In this talk, I'd like to share my experience using Itempool, give a live demo of it and take you on a tour behind the scenes. Just bring a second internet capable device (like a smartphone or tablet) to play along!

Jacci White and Monika Kiss - Saint Leo University

Teaching Intermediate Algebra during the Pandemic

During this presentation, Dr. White and Dr. Kiss will discuss how they taught Intermediate Algebra in the Hybrid format at Saint Leo University during the Fall 2020.
Both instructors used the same textbook, and worksheets to deliver the content to the students. They used MyMathLab to assess the students' knowledge both for assignments as well as tests.

They will share some strategies they both felt were providing positive outcomes as well as share some teaching strategies that were not as successful.
The session will begin with the presenters sharing their experiences teaching two different sections of the same class during the pandemic in the fall of 2020. Following their presentation, they will open up for discussion by all participants to share what has and has not worked for them in their classes. Please come ready to share so we can learn from each other.

Nkosi Alexander-Williams *- University of North Florida*

Bitangency Reconstruction

We discuss methods that help us solve the "bitangency reconstruction problem" for curves in the plane. Reconstructing curves based on information about their intersections and points of double tangency, our project is a generalization of the scene reconstruction problem and is a precursor to the bitangency reconstruction problem for surfaces. Specifically, we are doing the 2D case of the surface reconstruction problem, which will lead to the 2D bitangency reconstruction problem. Information gathered will be used to help understand the 3D bitangency reconstruction problem. This topic is not only applicable to differential geometry, but it models how someone sees objects, and thus has direct application to computer vision and computer graphics.

Gary Marmon, Matthew Kimm, Brian Le, Jay Kim, and Anthony Okafor *- University of West Florida*

Machine Learning Techniques and Applications to Higher Education: Student Dropout

Predicting student churn presents a unique classification problem: class imbalance, large volume of data that span multiple semesters, many correlated features, and churn of both low and high performing students. This study delves into various machine learning methodologies with the goal of predicting which students will and will not return after their first year at the university. The various models were tested using stratified k-fold cross validation using the same train and test sets. Different sampling techniques including undersampling, oversampling and synthetic minority oversampling are compared using accuracy, recall, precision, and f1 scores.

Jenna Bradley and Daniela Genova*– University of North Florida and* ***Joseph Ours*** *– State College of Florida*

Making Math Personal

Some students struggle to pass lower-level math classes for a variety of reasons. To help improve this situation we propose an innovative teaching method of Targeted Applications. The goal of the method is to motivate students by convincing them mathematics is useful for their major and career goals, boosting their self-efficacy in mathematics, and celebrating the joy of mathematics with them. We continue to improve and update our method as well as conduct further research. In this talk we explain our teaching technique and share some of the things we have learned along the way which prompted various improvements. Let's make math personal!

Contributed Papers Session II

Marshall Whittlesey *- California State University San Marcos*

Proving theorems in spherical geometry using the quaternions

It is well known that the complex numbers can be used to do transformation geometry in the plane. In particular, rotation by angle Θ about the origin is accomplished via multiplication by the complex number $e^{i\theta}=\cos\theta+ i \sin\theta$. It is less well known that the quaternion algebra (consisting of expressions of the form $a+b\mathbf{i}+c\mathbf{j}+d\mathbf{k}$ 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.

Jacob Aguilar *- Saint Leo University*

Modeling Asymptomatic Carriers in the COVID-19 Pandemic

In this talk, I will briefly discuss my recent results regarding the mathematical modeling of asymptomatic carriers in the COVID-19 Pandemic and cover the inherent complexities involved in modeling a new pandemic virus.

Gregory McColm *– University of South Florida*

The Geometry of Finding Your Way

Although geometry has a reputation for transcendent truth, one of its motivating sources was a practical need for accurate maps. Hellenic Greek geometers tended to come from Ionic cities that depended on maritime trade, and during the Hellenistic Greek, Roman, and medieval Islamic eras, a number of the famous geometric and astronomical projects were undertaken for the production of atlases. And the governments that paid for all this often had very prosaic motives, from facilitating commerce to imperial expansion. We take a brief tour of the relationship between geometry and map-making.

Adebukola Adeyemi, Carrie E. A. Grant & Kurt Sebastian *– Flagler College*

The Effects of Distance Learning

The global pandemic has thrown a curve ball at institutions of higher education. COVID has forced educators to reinvent themselves and their classrooms. Our goal to coordinate our Introductory Statistics course became more important in this world of distance learning. Course coordination describes coordination in the design, structure, and teaching of a course, to the extent that multiple instructors within a multi-section course have come to common agreement. We will share how our Statistics team continued to collaborate to create a learning environment that provided consistency to our students in varied learning platforms, hybrid and distance learning. Based on our experience, we will make recommendations regarding course coordination that will provide those in attendance ideas to use in their own institutions. Our discussion will include our course coordination model and the outcomes experienced over the last four years as the Introductory Statistics course was transformed into a coherent multi-section course.

Maggie Swanson and Menaka Navaratna – *Florida Gulf Coast University*

Implementation of Rapid Paired Classes (RPC) in lower-level math classes to improve DFW Rates

Among first-year students, math classes are considered to be one of the hardest. Students who start at Intermediate Algebra face the most difficult challenge because of their limited knowledge in basic math foundations. Historically, many have decided to drop off from STEM disciplines and have moved to non-STEM areas due to this hurdle. At FGCU, we offer Intermediate Algebra and College Algebra where one is a prerequisite of the other. The DFW rates of both courses were around 30-35%. Our study has only focused on improving the DFW rates of Intermediate Algebra and College Algebra classes in a new format called Rapid Paired class (RPC). Our presentation will talk about the RPC format, the variety of teaching mechanisms that were adopted, and the results of the study.

Stephanie Branham – *University of Tampa*

Maintaining Academic Integrity in an Online Environment

The pandemic has, in many ways, transformed the way educators instruct, engage, and assess their students. In many instances, reduced classroom seating capacities have forced some, or all assessments to move online. While technology makes this possible, it also opens the door for students to use prohibited materials during an exam. As instructors, how can we maintain and encourage students to take academic integrity seriously? What are in impacts on future course work if they do not? We will examine creative ways of making students think about academic integrity, and we will explore resources that may be used to discourage cheating in an online environment.

Graham Neitstel – *Florida Institute of Technology*

Last Exits of 2D Renewal-Reward Processes

We study a two-dimensional monotone increasing, renewal-reward process with two-dimensional rewards, assumed to be i.i.d. random vectors in $\mathbb{Z}+2$, but with mutually dependent components. We focus on the process as it approaches and surpasses predefined, fixed thresholds in both dimensions, and derive probabilistic details of the process at the time steps just before and just after the second dimension crosses its threshold. We use a stochastic series expansion and a discrete operator to derive a functional central to estimating the last crossing time and spatial position upon the last crossing.

Brendan Chamberlain – *University of North Florida*

Location Numbers of Graphs

This presentation discusses location numbers of connected graphs. For a connected graph G and a nonempty subset W of vertices of G, the locating code of a vertex v with respect to W is a vector whose entries are the distances between v and the vertices in W. We say that W is a locating set if every vertex in G has a unique locating code with respect to W. The location number of G is then defined as the size of the smallest locating set of G. We present characterizations of some classes of graphs, e.g. complete graphs and paths, using their location number.

Ryan White *– Florida Institute of Technology*

Exiting Patterns of Multivariate Renewal-Reward Processes

We study a vector-valued renewal-reward processes on $\mathbb{R}^d$. The jumps of the process are assumed to be i.i.d. monotone random vectors in $\mathbb{R}^d_+$ with mutually dependent components, each of which may be either discrete or continuous. Each component of the process has a fixed threshold. A formula for the probability of an arbitrary weak ordering of threshold crossings is derived. Analytic and numerical tractability of the result are demonstrated by an application to stochastic network reliability and some other special cases. Results are shown to agree with empirical probabilities generated through simulation of the processes in special cases.

Contributed Papers Session III

Reid Ginoza, Anthony Okafor-*University of West Florida*
Joseph Maestas *- Applied Research Associates, Emerald Coast Division*
D. Barrett Hardin *- Air Force Research Laboratory, Munitions Directorate*
Matthew Clay*- Air Force Research Laboratory, Munitions Directorate*

Semiparametric Models for Unreacted Equations of State in Modeling Detonation of High Explosives

When modeling the detonation of high explosives, it is important to accurately simulate shock propagation within the material of interest. The shock behavior is largely captured with an equation of state model, which describes the thermodynamic behavior of the unreacted material. While there are parametric forms for these models, such as linear and quadratic fits, that can be fit to shock data, this work explores the use of a semiparametric form with cubic b-splines to allow more flexibility in fitting the shock data. In order to optimize the fit, a genetic algorithm that respects convexity constraints is used to perform a global search. Two test cases to fit a spline equation of state to artificial experimental data result in good agreement.

Mohammad Rahman *– University of North Florida*

Impact of noise in the wave propagation in theta-dot network arises in mathematical neurosciences

We develop and apply a method of stochastic approximation to a canonical model arises in a circular process in mathematical neuroscience that has a parametric noise. We also investigate the role of noise in the circular process.

Lei Hsin Kuo - *University of West Florida*

RBFs Approximation with Ghost Points Optimization

The Meshfree method utilizing Radial Basis Functions is a well-known technique for solving interpolation problems and PDE problems. However, the accuracy and stability of the RBF approximation can be affected by the resultant ill-conditioned matrix. In recent years, we found that the RBF approximation accuracy could significantly be improved by adding the ghost points. In this presentation, we would like to present the ghost points technique and

find a suitable shape parameter associated with the ghost points.

Jia Liu *– University of West Florida*

A clustering technique for the Community Detection using Radial Basis Functions

In this paper, we propose an optimized algorithm for detecting the communities in the complex networks. We apply the radial basis functions to the corresponding similarity matrices according to the different networks. The structure of the network is exploited to develop an efficient matrix algorithm for the resulting systems. The proposed algorithm is used with the method of Spectral Clustering. The performance was measured via multiple evaluation metrics. The numerical experiments show the advantages of implementing the shaping parameter in the radial basis functions. Simulation results conducted on the synthetic data show that the optimized algorithm achieves excellent performance, especially for the large data sets.

Mihhail Berezovski *– Embry Riddle Aeronautical University*

Data-driven undergraduate research projects with business, industry, and government

In this talk, we will discuss the challenges of bringing collaboration with real business, industry, or government (BIG) into the data-driven undergraduate research. We highlight differences and challenges compare to traditional undergraduate research. We will discuss the possible ways to response to COVID19 situation and share ideas for successfully designing and mentoring such projects. The steps to build successful collaboration with BIG will also be presented.

Dennis Runde *– State College of Florida, Manatee and Sarasota*

How Many Points is that Worth? Assessing Problem Solving with Rubrics

A rubric is a chart composed of criteria for evaluation and levels of fulfillment of those criteria. A rubric allows for standardized evaluation according to specified criteria, making grading simpler and more transparent. In this presentation, we will discuss the use of a rubric to grade actual word problems from a College Algebra course. Participants will be invited to grade (separately or in groups) actual samples of work from College Algebra students' work. Participants will be given a rubric, based on research, to use for their own classes.

Contributed Papers Session IV

Anthony Okafor, ***Josaphat Uvah,*** *Brian Le, and Jay Kim - University of West Florida*

Who Is Most Likely at Risk of Underperforming in Their First Term: Discovering Interest Rules among FTIC

The first term performance among first time in college (FTIC) students is highly valuable. Some, but not all, are overwhelmed by being in a new environment. For the medium sized university in this study,

about half of the FTIC performed well during their first term in college, but half underperformed. It is known that having a higher than average first term GPA is linked to better graduation rates irrespective of college preparation such as AP credit and hours earned prior to enrolling in college. Aside from preparation, what factors influence the first term GPA of FTIC? This study uses association rules to identify important factors associated with underperformance by considering demographics, targeted majors, and commuting status. By identifying significant groups with potential improvement for targeted support, advising, or interventions, our results can be used to improve institutions' average performance for FTIC.

Lubomir Markov *– Barry University*

In Euler's footsteps: some results related to ζ(2) and ζ(3)

To Euler we owe the exact evaluation of ζ(2n) and in particular his solution to the Basel problem. It is not generally known that he also attempted to evaluate ζ(3), which attempt resulted in an interesting integral formula. In this talk, we'll discuss some results related to ζ(2). We'll also provide a very simple proof of Euler's formula involving ζ(3). All our investigations have been inspired by the work of Leonhard Euler – "the master of us all", and his methods.

Scott Demsky *– Broward College*

Classifying the reflection and stretching of the reciprocal function

We present a simple criterion to determine if the graph of a rational function of the form $f(x)=(ax+b)/(cx+d)$ includes a reflection of the reciprocal function $r(x)=1/x$ over the x-axis. In addition, we determine an algebraic expression for the factor by which the graph of $y=r(x)$ is stretched vertically to produce the graph of $y=f(x)$.

Lindsey Fox *– Eckerd College*

Promoting Diversity, Equity, and Inclusion in the Mathematics Classroom: Student Presentations on Historical Mathematicians from Underrepresented Identities

STEM fields often promote "objective" pedagogies (e.g., colorblindness) and often avoid discussion around diversity, equity, and inclusion. This is unfortunate because underrepresentation and marginalization is often accentuated in STEM fields. I seek to change this attitude in my own classroom by encouraging these difficult discussions and teaching how mathematics can be a tool for social justice.

This talk will be about my first foray into this venture. In an upper-level course last fall, I had each student give a short presentation on the life, struggles, and accomplishments of an influential mathematician from history with an underrepresented identity. Since the class took place remotely due to the ongoing pandemic, I challenged the students by prohibiting slideshows. The results were extremely creative!

Matthew Rudy Meangru *- University of East Anglia*

Exploring Undergraduate Student Engagement in a Virtual Developmental Mathematics Course through Mathematical Modelling Activities and 3D Modelling

Employing a mathematical modelling activity that utilizes a 3D modelling software with non-stem undergraduate students could deepen their engagement in virtual developmental mathematics classes. Due to Covid-19, the switch to virtual learning in developmental mathematics courses has caused some students to encounter difficulties in learning mathematics. Students enrolled in developmental courses tend to lack the basic foundation of mathematics (i.e. topics in algebra and geometry) and potentially have a negative view of mathematics. These students' mathematical affect, meaning their confidence in and attitude towards mathematics, is negative. To promote students' engagement in a virtual classroom, I developed a mathematical modelling activity that utilizes a free online 3D modelling software called Tinkercad. In this twenty-minute talk, I will share this modelling activity, demonstrating how it allows students to visualize and perform mathematical tasks on Tinkercad. I hypothesise that this activity could promote more meaningful student engagement in virtual developmental mathematics classrooms.

Lisa Cohen and Anurag Katyal *– Valencia College & Palm Beach State College*

Increasing homework access and improving outcomes through collaboration - one course at a time.

Online homework has become an imperative instructional resource. However, there are serious challenges regarding access, equity, and academic integrity. The major challenges are (a) Expensive publisher bundles - educators are limited in their selection of homework and instructional content. (b) Most publisher tools restrict sharing and use proprietary problem formats - this hinders collaborative authoring, the reuse of homework sets, and the supply of fresh content. (c) Until now, there were no sophisticated platforms for authoring and sharing homework sets.

Educators from various Florida institutions have started assembling and piloting online homework collections that can be paired with any OER or Commercial Textbook. These homework sets are the building blocks of an open catalog of customizable homework for Florida's gateway math courses. This effort provides an alternative to publisher bundles, improves access, addresses academic integrity along with students.

Caitlin Walsh *– Saint Leo University*

Math Anxiety: You Are Not Alone

Math anxiety is a considerable problem when reaching students of all ages and interests. In order to help people reach their highest potential, it is necessary to understand the origins of this fear. Previous research has found that students internalize their teachers' attitudes towards math (Jackson & Leffingwell, 1999). The current study investigated the relationship between an individual's likelihood of scoring high on a math anxiety scale and their past experiences, positive and negative, with math. It was predicted that math anxiety would increase as the extent to which participants were exposed to discouragement by teachers increased. Participants were asked if they had ever had a teacher or parent discourage their mathematical studies. They were also given Plake and Parker's (1982) Math Anxiety Scale ($a = 0.97$), which includes a Learning Math Anxiety scale ($a = 0.96$) and a Mathematical Evaluation scale ($a = 0.95$). An "enjoyment" scale ($a = 0.837$) concerning whether participants enjoyed math was developed by the researcher. A significant regression model was found [$F(1,397) = 205.745$, $p < 0.001$] in relation to this scale. The anxiety score can be predicted by using the equation, $99.677 – 2.564$(Enjoyment score). This model accounted for 34.1% of the variance. While a definite cause was not discovered, this does allow us to focus future research.

Madyson Woodburn, Alyssa Bernstein and Lindsey Fox– *Eckerd College*

Mathematically Modeling the Transmission of COVID-19 at Eckerd College

The COVID-19 pandemic has posed many challenges for colleges and universities around the world. Schools must maintain their academic standards while also implementing a strong response to the virus. In particular, small liberal arts colleges, such as Eckerd College in St. Petersburg, FL, have limited housing space available but must provide enough quarantine beds to support a small outbreak. In this study, we constructed an epidemiological model that uses a system of ordinary differential equations to describe the dynamics of transmission of COVID-19 on Eckerd College's campus. The classes of the model include susceptible, asymptomatic, infectious, and recovered, as well as three different quarantine classes used to incorporate Eckerd's testing approach. The goal of the model is to estimate the number of quarantine beds Eckerd College will need.

Contributed Papers Session V

Jay Kim, Matthew Kimm, Gary Marmon, and Anthony Okafor - *University of West Florida*

Who Will Leave or Who Will Stay? Associating FTIC Admissions Data with Atypical APR Performance Using Apriori Algorithm

When students apply to college, the admissions office evaluates their potential by checking factors such as their high school GPA and standard test scores. However, not all first time in college students (FTIC) go on to perform as well as expected – some dropout due to under performance, and some over performers transfer to other institutions. This study examines what entry level factors such as prior university credit hours, financial aid, and targeted degree programs, in combination with first semester performance, are strongly associated with atypical academic progress rate (APR) performance and non-retention. The analysis uses apriori algorithm and determines what combinations of elements could characterize non-returning atypical performers, and what elements are strongly associated in those characterization rules.

Matthew Kimm, Gary Marmon, Jay Kim and Anthony Okafor- *University of West Florida*

Applications of Webpage Ranking to Course Difficulty and Recommendation

Student course schedule optimization by measuring course difficulty and providing personalized course recommendations naturally parallels the personalization approaches of webpage ranking. We discuss the history and formulation of Pagerank, Personalized Pagerank, and Hyperlink-Induced Topic Search (HITS) for webpage ranking. Then, we note some of the mathematical properties of these tools to motivate a discussion of the applications. The applications under consideration include ranking courses using Pagerank and recommending courses using HITS. We conclude by measuring the potential improvement in schedule pass rates.

Donald McGinn - *University of West Florida*

Pell-type equations and near-square primes

An outstanding conjecture in number theory is that there are infinitely many near-square primes, which are primes of the form n^2+1. This is part of a larger conjecture on prime producing polynomials. In this talk, we make a connection between factorizations of near-square numbers and Pell-type equations, and provide multiple variations of the near-square primes conjecture.

Adriane Griffith, Paula Collado Cordon, and Veronica Schlauri Quezada *– Rollins College*

Analysis of COVID-19's Impact Among College Students in a Suburban Community

The SIR model created by Kermack and McKendrick (1927, 1932, and 1933) has been applied to numerous disease outbreaks in order to predict their behavior and the possible duration of an outbreak. The COVID-19 disease has had a global impact and the use of mathematics has helped with behavior prediction of this virus. COVID-19 has continued to spread rapidly within the Winter Park community. We decided to study the effects of students returning to campus in the Winter Park community. To analyze these effects, we used the Basic Reproductive Number (Ro), which is the expected number of cases that on average an infected person spreads the virus to a completely susceptible population. Using mathematical modeling and differential equations, we were able better understand the severity of the COVID-19 crisis and estimate a potential for an outbreak.

Daniel Jelsovsky and Susan *Serrano – Florida Southern College*

Introducing an Applied Math Major at a Small Liberal Arts College

Increasingly, students and more importantly parents of students are viewing college as a commodity, where majors are chosen by job prospects and not academic interest. In this environment, it is getting more and more difficult to convince students at a small, liberal arts college to major in pure mathematics. At the same time, mathematics and statistics are increasingly important in the modern workplace. In order to try to resolve this contradiction, and attract new majors, we have developed a new Applied Mathematics and Statistics major aimed at students (and parents) who are primarily focused on direct career paths. We will detail developing our new major and its implementation, as well as discussing early results in terms of enrollment.

Milé Krajčevski *– University of South Florida*

The role of visualization in undergraduate mathematics

We emphasize the importance of visualization in undergraduate mathematics courses and suggest drawing-to-learn intervention that will help students solidify concept images of mathematical objects through drawing activity. Utilizing undergraduate Vector Calculus course, we'll suggest some drawing practices that regard created images as manipulatives that provide concrete foundation for learning abstract mathematical notions.

Kevin Murphy *– Saint Leo University*

Using Kahoot! to Improve Participation in a General Education Mathematics Course

This talk will go over some basics of the free Kahoot! quiz app and discuss how to easily implement short quizzes to check all of your students' understanding, while also sparking a competitive desire to succeed. Come prepared with the Kahoot app installed on your phone, or you can split screen the session with a browser opened to kahoot.it. This will also go over some strengths and limitations of the software and feedback from Fall semester.

Shreya Bose *– Florida State University*

Kyle-Back models with risk aversion and non-Gaussian beliefs

In this talk, we show that the existence of equilibrium in the Kyle-Back models can be characterized by considering a system of forward Fokker-Planck equation and a system of backward quasilinear parabolic partial differential equations coupled via an optimal transport type constraint at maturity. We also study the properties of the equilibrium in our model where the insider is risk averse and the market maker's belief on the distribution of the price at final time can be non-gaussian. This is based on a joint work with I. Ekren.

Laura Babicean and Darryl Chamberlain Jr *– University of Florida*

Analyzing student achievement with residential and online students in College Algebra

Most students at the University of Florida fall under one of two broad classifications: residential or online. Until Spring 2020, residential students took a hybrid version of College Algebra while online students took an online-only version. Hybrid students met with a teaching assistant once a week to review content. Content videos, homework system, and support were otherwise equivalent between the delivery methods. Using students' scores from a common final exam in Fall 2019 and Fall 2020, we will show that these two populations achieved at statistically significantly rates. Our results suggest the differences in achievement were not due to the delivery method and thus the populations of students are inherently different.

Paul Johnson and Kate E. Johnson *- Biostat Software Development and University of California Davis*

Hailstone Numbers, Stopping Lengths and the Collatz Conjecture

This presentation examines hailstone numbers, their stopping lengths and examines the Collatz conjecture. The Collatz conjecture has yet to be proved (or disproved). Tao (2020) showed that the Collatz conjecture is almost true for almost all numbers; and that almost all orbits of the Collatz map attain almost bounded values. There are quite a few 'almosts' mentioned in the preceding sentence. The stopping length is the length of the sequence i.e., how many numbers in the sequence before we reach the endpoint '1'. The number 63,728,127 requires 949 steps. In 2020 it was found that 1,339,302,163,616,345,727 requires 2,330 steps (see Roosendaal, 2020). 9,780,657,630 and 9,780,657,631 both require 1132 steps, yet 9,780,657,629 and 9,780,657,632 (their neighbors) both require only 235 steps. In this presentation we examine some of the seemingly not so random patterns of the stopping lengths of integers, and their neighbors, of the Collatz conjecture.

Plenary Sessions

Jennifer Quinn – President of Mathematical Association of America

Bio:

Jenny Quinn is President of the MAA and 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, Jenny 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, Jenny 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.

Jenny has held many positions of national leadership in mathematics including Executive Director of the Association for Women in Mathematics and previously for 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.

Digraphs and Determinants: Determinants through Determined Ants

In linear algebra, you learned how to compute and interpret determinants. Along the way, you likely encountered some interesting matrix identities involving beautiful patterns. Are these determinantal identities coincidental or is there something deeper involved? In this talk, I will show you that determinants can be understood combinatorially by counting paths in well-chosen directed graphs. We will work to connect digraphs and determinants using two approaches:

- Given a "pretty" matrix, can we design a (possibly weighted) digraph that clearly visualizes its determinant?
- Given a "nice" directed graph, can we find an associated matrix and its determinant?

Previous knowledge of determinants is an advantage but not a necessity. This will be a hands-on session, so bring your creativity and be prepared to explore the
mathematical connections.

J. Brian Conrey – Executive Director of American Institute of Mathematics

Bio:

John Brian Conrey is the executive director of the American Institute of Mathematics. His research interests are in number theory, specifically analysis of L-functions and the Riemann zeta function. He received his B.S. from Santa Clara University in 1976 and received his Ph.D. at the University of Michigan in 1980. He is the founding executive director of the American Institute of Mathematics and on the editing board of the Journal of Number Theory. The American Mathematical Society jointly awarded him the eighth annual Levi L. Conant Prize for expository writing in 2008 for The Riemann Hypothesis. In 2015 he was elected as a fellow of the American Mathematical Society.
Since 2005 he has been part-time professor at the University of Bristol, England.

Everyday Intransitivity

If A beats B most of the time and B beats C most of the time, is it true that A beats C most of the time? If not, we have an intransitive situation. We give some mathematical examples to show that intransitivity may be more prevalent than one might at first think.

Donal O'Shea – President of New College of Florida

Bio:

Donal O'Shea has been president of New College of Florida since 2012, where he has increased academic excellence and enhanced diversity and student life. He secured funding and oversaw planning for a new science building and for a cutting-edge master's program in Data Science, New College's first graduate program. He aims to increase the enrollment of New College by 50 percent, with commitments from the state to fund proportionate increases in faculty, staff and facilities. O'Shea earned an A.B. from Harvard University and an M.S. and Ph.D. from Queen's University, all in mathematics. An internationally known mathematician, he continues to work with collaborators around the world. His research interests center around singularities of higher dimensional algebraic surfaces, work which mixes algebraic geometry and differential topology and geometry. He has also published in a number of applied areas, including medical imagining, phase transitions, and mathematical physics. He has won numerous awards for his work, most in recently in January 2016, when a groundbreaking, now classic, book he wrote with two colleagues was awarded the coveted Steele prize by the American Mathematical Society.

Polynomial Knots

Alan Durfee & Donal O'Shea

A polynomial knot is a smooth embedding kappa : R ->R^3, the components of which are polynomials. Any classical knot can be represented as a polynomial knot, so that the theory of polynomial knots subsumes classical knot theory. However, polynomial knots are algebraic, as well as topological, objects.
As a result, very interesting natural questions quickly arise that point to deep, poorly understood connections between the algebra and topology of knots. The talk will review basic results and examples due to Alan Durfee, Donal O'Shea and many, many others. The speaker (Don O'Shea) promises to work hard to make it accessible to students with two (and maybe just one) semesters of calculus.

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