

The 2012
**3rd Annual California Community College
Math Conference**

Program and Abstracts

**Friday, November 16
10am-6:30pm
North Science Building, Room 623
Fullerton College**

321 E. Chapman, Fullerton CA 92832-2095
Dr. Dana Clahane and Dr. William Cowieson
Conference Organizers

9:30am-6pm Registration (Free and open to the public) ENGAGE in STEM and the organizers request that all participants, including speakers, register by signing the sign-in sheet (please print legibly), so that we can continue to fund this conference! Please don't feel obligated to give us your email address, unless you would like to be included on the FC Math Club/Colloquium/Newsletter email list.

All student speakers should keep in mind that for these talks, it is best to only assume that participants have had a second year high school algebra course, so it is best to clearly define your terms with examples wherever possible, if time permits, so that everyone can follow you. Please contact Dana Clahane at dclahane(AT)fullcoll(DOT)edu if you have any questions or would like to have your presentation reviewed. Also, please be aware of your time, as it is never a good idea to go overtime in a talk. This will give you all great practice! We welcome all participants, and not only speakers. The conference is open to the public, but again, please sign-in so that we can have an accurate attendance count for funding purposes.

10-10:25am Welcome, and "Let's Prove Something About the Riemann-zeta Function", by Dr. Dana Clahane (Fullerton College)

Abstract: In this talk, we will state the Riemann Hypothesis, and we will examine a global series expansion for the Riemann zeta function valid on the complex plane except with a simple pole at 1. We start crudely by simply finding the value of the series at 0. The Clay Institute has offered a \$1 million prize to anyone who proves or disproves that other than at the negative even integers, this series has value 0 only at complex numbers with real part $1/2$. This problem is now considered the Holy Grail of mathematics. Will a community college student or students and/or faculty contribute to its resolution, maybe even together?

10:35-11am:

Dr. Scot Childress (College of the Desert)

TITLE:

More on the Riemann-zeta Function

ABSTRACT:

Dr. Childress is an energetic and extremely lucid speaker, who will delve further into exploration of the Riemann-zeta function. We are happy to have Dr. Childress back as a special guest speaker! He is a mathematical physicist who has spoken at the Pacific Summer Unsolved Mathematics Seminar and also at the FC Math Colloquium during its first year 2009-2010.

11:10-11:30am:

Evan Amoranto (Fullerton College)

Evan Amoranto is an extremely clear speaker who has a particular talent for explaining complicated concepts. He is completing multivariable calculus under Stephen Plett and has given talks at the Math Colloquium, the Pacific Coast Undergraduate Math Conference, the Pacific Summer Unsolved Mathematics Seminar, and, Evan was one of four students who are the first in Fullerton College history to speak at a sectional meeting of the Mathematical Association of America. *Mentor: Dana Clahane*

TITLE:

Fibonacci Numbers, Primes, Metafibonacci Numbers, and Closest Return Times of Polynomials

ABSTRACT:

In this talk, I will define Fibonacci numbers and their many generalizations, such as the well-known r-bonacci numbers. I am delving into a FC Math Colloquium Fall 2011 lecture by Nathaniel Emerson in which he showed us an even further generalization, which relates, it turns out, to closest return times of polynomials, thus connecting these numbers to dynamical systems. This seems to be a wide open area of investigation, but I will mention some open questions about prime numbers that are r-bonacci or Fibonacci numbers. *Mentor: Dana Clahane*

11:40am-12pm:

Ryan Trias (Fullerton College)

Mr. Trias is currently an active participant in the Time-frequency analysis/N-Body Problems Informal Learning Seminar which is held Mondays in Room 626, 6-6:50pm. He was also an inaugural ENGAGE in STEM research intern in Summer 2012. A poster prize winner at the 2012 MAA Southern California-Nevada Sectional Meeting, Mr. Trias, has previously given talks at the Fullerton Math Colloquium the Pacific Summer Unsolved Mathematics Seminar, and the Pacific Coast Undergraduate Mathematics Conference.

TITLE:

Fundamental Concepts in Digital Signal Processing (DSP)

ABSTRACT:

To answer the growth of digital technologies, it is important for scientists to address demands of processing analog signals into the digital domain. Digital signal processing enables audio engineers to compute continuous signals using digital processing to analyze and transform signals while preserving signal fidelity faithfully and powerfully. *Mentor: Dana Clahane*

Some sources:

<http://www.dspguide.com/ch5/1.htm>

<http://www.dspguide.com/ch8/1.htm>

<http://www.thefouriertransform.com/#introduction>

<http://faculty.uml.edu/cbyrne/SP1text.pdf>

12-12:30pm Pizza and refreshments

12:30-12:50pm:

Mohammad Khan (Fullerton College)

Mr. Khan is a superb Math Seminar student of Dr. Cowieson who has a knack for tackling rigorous and difficult material. He is a very active Math Club member and a problem attacker.

TITLE:

Khabibullin's Conjecture

ABSTRACT:

This conjecture was proposed by the mathematician who bears its name, in 1992, and the problem of either proving or disproving it remains unsolved, twenty years later. I will state the problem which involves inequalities containing integrals, and what is known about it to date.

1-1:25pm:

Ben Hartley (Fullerton College '12, UC Santa Cruz ('14))

Mr. Hartley comes back to us for a visit after having transferred this quarter, successfully, to UC Santa Cruz, where he is taking, among other courses, an introduction to proofs. Mr. Hartley was a Summer 2012 ENGAGE in STEM Research Intern, and he spoke at this conference last year. He has also given talks at the Math Colloquium at Fullerton College, as well as the Pacific Coast Undergraduate Math Conference.

TITLE:

Pentagons and the cosine of 72 degrees

ABSTRACT:

I will show how one can use geometry and complex numbers to calculate the exact value of the cosine of 72 degrees.

1:35-2pm:

Dr. William Cowieson (Fullerton College)

TITLE:

The Trivial Zeros of the Riemann-zeta Function

ABSTRACT:

The negative even integers are known to be zeros of the famous Riemann-zeta function defined on the complex plane except with a simple pole at 1. These zeros are called trivial. I will show why these are indeed zeros. If time permits, I will discuss why a known global series expansion for this function converges everywhere except at 1, and I'll also show why it is the same as the usually given simpler sum of $1/n^s$, where $\text{Re } s > 1$.

2:10-2:30pm:

Valerie Guerra (Fullerton College)

Ms. Guerra is currently a second-semester calculus student and also serves as an ENGAGE in STEM research and coordination intern with Mr. Raul Reyes, who is also speaking at this conference. She is a dedicated mathematician and has given talks at the Math Colloquium, the Pacific Coast Undergraduate Math Conference, and was one of the first four FC students to give a talk at a meeting of the Mathematical Association of America (MAA) earlier this Fall. *Mentors: Dana Clahane and Bill Cowieson*

TITLE:

The Search for the Exact Value of Bloch's Constant

ABSTRACT:

Bloch's constant is named after a mathematician who is infamous for killing family members of his. Strangely, while he was in prison, he produced brilliant mathematical work. We will discuss how Bloch's constant arises, and the unsolved problem of finding its exact value, one of the most famous open problems in complex analysis.

3:10-3:30pm:

Mitchell Hoertz (Fullerton College)

Mr. Hoertz is an engineering student who is very talented in mathematics and has completed the calculus, linear algebra, and differential sequence at Fullerton College and is now taking other needed science courses. He is very interested in turbulence and fluid flow.

TITLE:

The Euler Equations

ABSTRACT:

Trevor Ta will be giving a talk later in the day on the more general Navier-Stokes Equations, but I will focus on the special case when the viscosity is zero, thus yielding the Euler equations, which I will define and describe. I will also give some information about progress on the this problem, as time permits. Although a one million dollar prize has been offered for a physically reasonable and smooth solution to the Navier-Stokes Equations, considered one of the seven most notorious unsolved problems in all of mathematical science, such solutions have not been proven to exist or not to exist, even for the case when the viscosity is 0, the setting of the Euler Equations. *Mentor: Dana Clahane*

REFRESHMENT BREAK, 3:30-3:45pm

3:45-4:05pm:

John Mahoney (Fullerton College)

Mr. Mahoney is a very talented and intelligent mechanical engineer who sees the value of progressing in higher mathematics, so he has been a Math 295 Seminar student and has also previously spoken at the Math Colloquium on this topic. He is an excellent speaker.

TITLE:

The P vs. NP Conjecture

ABSTRACT:

The P vs. NP Conjecture is one of the one million dollar prize problems promoted by the Clay Institute, and the proof or disproof of this conjecture has proven quite elusive, with every claimed proof or disproof, so far, turning out to be invalid for one reason or another. I will explain what the conjecture says and some history of the problem, which is considered the most important unsolved problem in computer science, viewed as a branch of mathematical science. *Mentor: Dana Clahane*

4:50-5:10pm:

Keziah Tan (Fullerton College)

Ms. Tan has served superbly as the Fall 2012 FC Math Club President, and she is a very strong mathematician. She has given talks at the Math Colloquium at Fullerton College and also at the Pacific Undergraduate Math Conference. Don't miss her beautiful lecture!

TITLE:

Euler's Identity: The Shakespearean Sonnet of Mathematical Equations

ABSTRACT:

Euler's Identity is well known to mathematicians and physicists, many of whom, claim it to be a beauty in mathematics for the equations form and meaning behind it. This talk is an exposition of the proof of Euler's Formula and Identity using Taylor Series, the implications of their truth and the applications of Euler's formula and identity in the field of mathematics and other fields. This talk aims to teach and show the audience the beauty of the equation as well as its uses. *Mentors: Dana Clahane and Bill Cowieson*

5:20-5:45pm:

Khoi Vo (UCLA)

TITLE:

An Introduction to Quaternions

ABSTRACT:

Have you ever thought of rotating a vector in a 3-dimensional space around an axis? There are multiple ways of doing this, such as Euler angle and rotation matrix methods. However, these methods require extensive computations. W. R. Hamilton a method which he called "Quaternions". This method has been applied in various fields such as computer graphics, computer vision, robotics, navigation and dynamics. Through definitions, basic properties and theorems, we'll introduce the idea of what a quaternion is and how can we apply it in rotating a 3-dimensional object. *Mentor: Dana Clahane*

5:55-6:15pm:

Triet (Trevor) Tahien (Ta) (Fullerton College)

Mr. Tahien is an outstanding FC Math student who has previously spoken at the Math Colloquium and was the Round 1 FC champion in the AMATYC Student Math League Competition this semester. He has also contributed top-5 scores last year, enabling FC to rank 6th overall last year in the nation, the highest ranking for FC ever. This year's score puts FC on pace to finish even stronger this year. He also happens to be very talented at pursuing research topics, as you will see from his excellently prepared presentation.

TITLE:

The Navier-Stokes Equations

ABSTRACT:

A Clay Millennium Prize one million dollar problem, finding or proving that one can't find smooth, physically reasonable solutions to the Navier-Stokes Equations is considered one of the seven most important open problems in mathematics. I will define this problem and discuss some of the physics involve in it, and I will consider examples as time permits. *Mentors: Dana Clahane and Bill Cowieson*

6:25pm, approximately:

Let's do this again next year!