

TCM Conference 2004 Title and Talk Descriptions

Guest Speakers

Rethinking Regression: Is There a Better Way to Teach Curve Fitting?

Nils Ahbel, Deerfield Academy, Deerfield, MA

When using the built-in regression tools of graphics calculators, students are doing little more than matching the shape of a scatterplot to the shape of a toolkit function graph; the calculator does the rest of the “thinking”. There are a limited number of regression tools, but an infinite number of possible functions. In this session an approach will be explored in which students decide which function or transformation/composition of functions best fits the scatterplot and adjust each function parameter. The ideas will be demonstrated with both Fathom and the TI-83 Transformation Graphing APP.

Applications of Matrices in a Discrete Math Class

David Bannard, Collegiate School, Richmond, VA

Google has been called the largest matrix ever created. Learn how to apply matrices to graph theory and Markov chains. In the process, we will see how matrices can be used on Orbitz, to predict the economic future of large companies, and to rank college football teams.

The Hat Problem – An Introduction to Parametric Equations

Gloria Barrett, NCSSM, Durham, NC

The problem shared in this session was created by Alan Bellman; it prompts students to model the travel of a hat blown from Alan’s head by a gust of wind. We use the problem at NCSSM to introduce parametric equations in our precalculus course. As we work through the problem, students find that the model they create does not agree with what really happened. At that point, they gather free fall data using CBL in order to refine the model. Conference participants will assume the role of students as we work through this problem together.

Make Your Own Stereo Images

Floyd Bullard, NCSSM, Durham, NC

Your brain can be tricked into seeing depth in a flat image if each of your eyes sees a slightly different version of the image. This is sometimes achieved by using special glasses with red and blue tinted lenses in what is called an “anaglyph”. In this talk we’ll see how anaglyphs work, we’ll look at a few both old and new, and then we’ll create our own anaglyphs of solid geometric objects using principles accessible to Algebra II or Precalculus students. 3-D glasses will be provided for you to keep.

What is a Fractal?

David Chan, NCSSM, Durham, NC

I will discuss what fractals are and how one could use these in a Precalculus class and a Calculus class. Fractals are a variety of objects that have special properties. There are aspects to fractals that are accessible to most students. There are also many ways to produce fractals using technology.

Using Data to Enhance the Study of Functions

Helen Compton, NCSSM

Applying data analysis techniques to existing data or data that students collect can help students identify the function that models the relationship between variables. In this session, we will look at a data set based on travel on the New Jersey Turnpike and data from a paper folding activity. Using the TI-83 calculator, we will graph the data, discuss potential models, and find those models. These problems can be used in an Algebra 2, Advanced Functions and Modeling, or Precalculus class.

Sharing Algebra 2 Ideas and Experiences

Helen Compton, Maria Hernandez, Donita Robinson, NCSSM

Algebra 2 teachers will share experiences of using extended problems in real-life settings to achieve specified goals of the North Carolina Standard Course of Study for Algebra 2. This session is designed as a follow-up to the Leading to Success in Algebra 2 Workshop of June 2003; however, anyone who is interested is welcome. We will also look at ways to implement good ideas we have heard at this TCM Conference.

Three Ways to Re-express Quadratic Data

Peggy Craft, NCSSM, Durham, NC

If the planet Earth had a bumper sticker, it might say "Parabolas Happen"! The (virtually) constant acceleration of falling objects makes it easy for us to collect quadratic data. Understanding how to fit such data with a model is important, so we'll learn to do it three different ways. Each re-expression produces a very different type of model. This will be "hands-on", so bring your TI!

Trig Saga – Adventures in Trigonometry

Anna DeConti, NCSSM Distance Learning, Durham, NC

Using an adventure story, students can work on solving trigonometric problems using sinusoids, right triangles, and laws of sines and cosines to complete the journey.

Mardi Gras Beads, Parabolas, and Catenaries

Dot Doyle, NCSSM, Durham, NC

When your algebra or precalculus students see a freely hanging rope or chain (or in our case Mardi gras beads), what function do they think models the shape they see? My students usually assume they are seeing a parabola. In this session I will share an activity I do with students to help them understand that the correct function model is actually a catenary, a sum of exponential functions.

Connecting f to f' to f''

Kay Fenton, Episcopal High School, Baton Rouge, LA

The relationships between a function and its first and second derivatives have long been a source of confusion for calculus students. In this session we will discuss ways to help students connect functions and derivatives. Several hands-on activities will be included, as well as examples from previous AP exams and other sources. Finally, we will investigate slope fields and discuss ways to introduce them to students and use them in class.

Aha! Statistics Simulations for Understanding

Landy Godbold, The Westminster Schools, Atlanta, GA

Participants will conduct a variety of simulations, some simple and some more complex, designed to help develop conceptual understanding of concepts that many students in AP Statistics find difficult.

Pass the Candy – An Introduction to Recursive Equations

Maria Hernandez, NCSSM, Durham, NC

We will explore a fun problem that may be used to introduce recursive systems in Algebra 2, Advanced Functions and Modeling, or Precalculus. As we explore the coupled recursive system, we'll investigate various starting scenarios and generate numerical and graphical solutions using the TI calculator. The discrete nature of the problem poses difficulties in finding a closed form analytic solution, but leads us to explore a possible matrix solution. Put your calculators in SEQUENCE mode and bring your sweet tooth!

Playing with Rotation Matrices

Christopher H. Jones, Horace Mann School, New York, NY

What happens when our students take the initiative and “play” with the ideas we have laid out in class? Good things! In this session we will examine a surprising problem generated by a student who was playing with rotation matrices on his TI-83. In the process, we will visit how to rotate parametrically defined curves (on the TI-83), how to generate a fancy locus on Geometer's Sketchpad, and, time allowing, how to rotate curves in three dimensions.

The Velocity-Height Problem

Allen Martin, Loyola High School, Los Angeles, CA

Starting from a velocity function for a particle projected into the air, we will use some simple modeling assumptions and create a couple of very short TI-83 programs that will let us investigate the maximum height attained by the particle. Finally, reflecting graphically on our methods, we will gain new insights and see new connections. Related topics include introduction to integration and Euler's Method. Appropriate for Precalculus and Calculus classes. Bring your TI-83.

Quadratics, Transformations, and CBRs

Jerald Murdock, Interlochen Arts Academy, Interlochen, MI

We can help students gain important conceptual understandings as they build up their "bank" of basic symbolic algebra skills. Modeling helps provide students with a logical reason for learning algebra.

Some Eclectic Precalculus Problems

Ira Nirenberg, Ben Franklin High School, New Orleans, LA

Looking for some interesting Precalculus problems to share with your students? Well, you must be in the right place! Concise worksheets and Calculator Based Problems (CBP) will be shared so you can get started immediately.

Collecting Exponential Data with CBL2

Donita Robinson, NCSSM, Durham, NC

Working in groups, participants will collect voltage data using the CBL2. As we analyze the data, we will discuss a possible lesson plan for this activity. This problem could be geared toward students in Algebra 2, Precalculus, or Advanced Functions and Modeling (a new course in the NC DPI curriculum). We will be using the TI-83+ graphing calculators with the DataMate App (we can link the App if you don't have it on your calculator).

Hear Your Math

Steve Sigur, The Paideia School, Atlanta, GA

In this age of high technology and diverse learning styles, we look for new ways to allow students to understand the mathematical functions we teach. Cheap or free technology allows us to hear a function as well as to see it. This talk explains how to add sound to your teaching and your classroom. Most appropriate for Precalculus teachers.

Data Analysis or Inference: Connecting Statistics with Other Disciplines

Daren Starnes, The Webb Schools, Claremont, CA

Data analysis is possible for any data set. Inference requires data produced more carefully. We'll distinguish between them using examples from psychology, education, and environmental science. Bring your TI-83.

Group Testing Procedure: A Modeling Activity for Precalculus and Calculus

Dan Teague, NCSSM, Durham, NC

There are many examples of large-scale drug testing in American society. Suppose the NCAA wants to test all NCAA athletes for the new "designer" steroid. How can they test everyone at least cost? This talk will present both Precalculus and Calculus solutions to the following problem: You have a large population that you wish to test for a certain characteristic in their blood or urine. Since the number of individuals to be tested is quite large, you wish to reduce the number of tests needed to screen everyone. If the blood or urine could be pooled by putting samples together and then testing the pooled sample, the number of tests required might be reduced. What is the relationship between the probability of an individual testing positive and the group size that minimizes the total number of tests required?

Modeling the Spread of SARS: An Investigation for Calculus***Dan Teague, NCSSM, Durham, NC***

Last spring, the SARS epidemic was disrupting daily life for millions of people around the world. Students saw many photographs of people in the most affected countries wearing face masks. How good would a face mask have to be to really affect the spread of the disease. In this investigation, students use the SIR compartment model to describe the spread of SARS. Data from hospital stays and the effectiveness of different kinds of masks in controlling respiratory secretions are used to evaluate the efficacy of wearing masks to control the spread of SARS. Students use Euler's method to generate numerical solutions and follow up with analytic solutions to understand why the numerical methods gave the results they did.

Math Projects that Liven Up a Classroom***Margaret Wirth, East Carolina University, Greenville, NC***

Projects designed for advanced math classes including precalculus, discrete math, and statistics will be shared. Handouts for the activities will be available.