

math news

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Are We Among Your Likes?

FSU's Department of Mathematics is on Facebook at <http://www.facebook.com/pages/Frostburg-State-Department-of-Mathematics/171489296198221>. Be among the first to know what's happening in the mathematics department and in the world of mathematics. Share your views and experiences with others in the Frostburg community. Stay up to date on everything math related – We hope for 200 “likes” before the end of the year.

When Will I Ever Use This?

For undergraduates, all of the top ten best-paying college degrees, according to PayScale, require mathematics. A similar report from the National Association of Colleges and Employers found that to be the case for their top fifteen most lucrative degrees. Furthermore, the Bureau of Labor Statistics projects two more occupations that require mathematics – computer specialists and biomedical personnel – to be among the fastest growing occupations through 2018. Auto mechanics and electricians use increasingly more and more mathematics, as do people in manufacturing and production careers. As jobs become more competitive, job applicants with math knowledge have an edge on others.

The Mathematical Association of America has published career profiles of professionals who use mathematics in their occupations at www.maa.org/careers/profiles.html.

A Combinatorial Carol

How many gifts were given and received in total during the run of the traditional carol “The Twelve Days of Christmas”? Two points of clarification: 1) A partridge in a pear tree is to be considered one gift, whereas five gold rings count as five gifts. 2) Notice, of course that, for example, TWELVE partridges in pear trees are conveyed in total.

Professor Claus's extra credit assignment: Estimate the total surface area of the wrapping paper required and the total volume needed near the Christmas tree.

The Pizza Paradox: Easy As Pi

(Solution to problem from last issue)

Since all pizza rings with ten-inch chords tangent to a central hole have the same area, we can consider the one with a hole diameter of zero inches. In that case, the ten-inch chord is actually the diameter of the pie, so the answer is 25π square inches.

KME Corner

Speaking of pizza, Kappa Mu Epsilon met on November 27th. To hear Dr. Frank Barnet give “A Tour of the Gravitational Environment of a Rotating Space Station”. The talk incorporated *Mathematica*-generated anaglyphs and animations to describe trajectories inside a rotating cylinder.

Also, Dr. Marc Michael unveiled the design of a new departmental tee shirt. The shirts will be distributed by the end of the semester.

Undergraduate Research

By Bryan Martin

Dynamical Systems Theory is a branch of mathematics that takes an iterative approach to reveal infinitely diverse patterns from non-linear functions. As a platform for my research, I began my exploration with the earliest non-linear equation I ever learned; the quadratic function $y=x^2$. I extended my research to consider the entire Quadratic Family defined as $Q(x)=x^2+C$, where C is any real number.

When viewed within the realm of dynamical systems, the humble quadratic function reveals some fascinating behavior. The quadratic function $Q(x)=x^2+C$ is applied to an initial point x_0 . This process is iterated using composition. The result is a sequence of numbers: $\{x_0, Q(x_0), Q^2(x_0), Q^3(x_0), \dots\}$. This sequence can exhibit widely varying behaviors relative to the choice of C , selected from the infinite set of real numbers. Within some intervals of C , the initial points of very similar degree will behave with unexpected diversity. For some values of C , chaos is found.

Dynamical Systems Theory shows us that even within the idealized world of mathematics, there are still elements which are unmanageable, unpredictable and chaotic. This mathematical perspective of chaos is of philosophical interest. It requires that a system is dense and sensitive. An infinite pattern is one that we will never see repeat, yet it is within a deterministic system. How long must a pattern be for its repeating to lack a witness?

Computer generated graphics have assisted many breakthroughs in the field as they provide intuitive characterizations of sequence behaviors. The computer is well equipped to process high rates of iterations and manage near-infinite arrays of sequences into visualizations. Graphics and video made as part of my research can be viewed at www.bryanrichardmartin.com/dynamicalsystems.