MSCS Mess

Epidemiology Talks

Title	**Mathematics and Disease: The case of Tuberculosis**
Presenter:	Dr. Castillo-Chavez
Date:	Tuesday April 29
Time:	1:30 pm
Location:	SC 188

In this talk, the role of mathematics in the study of disease dynamics over the past century will be highlighted. The role of mathematics in epidemiology through the introduction of mathematical models used to enhance our understanding of the evolution and the transmission dynamics of tuberculosis will be illustrated with emphasis on finding ways of reducing the disease's burden. The talk will be accessible to undergraduates and to biology majors interested in the use of models in the life and social sciences.

Title:	**The Dynamics of Disease in the 21st Century: From Vaccines to Homeland Security**
Presenter:	Dr. Castillo-Chavez
Date:	Tuesday April 29
Time:	7 pm
Location:	SC 170

Globalization means that the health challenges faced by the world today should not and cannot be ignored locally. In this lecture, the role of medical doctors/scientists in the development and use of models to understand, predict and plan for the potentially devastating consequences associated with epidemics or pandemics will be revisited. The use of models and simulations in evaluating the role of vaccines to prevent death and disease as well as their role in the development of contingency plans that our society must make in the event of a flu outbreak or the deliberate release of a biological agent will also be highlighted. The lecture will be accessible to general audiences.

Bio: Dr. Carlos Castillo-Chavez is University Regents Professor and Joaquin Bustoz Jr. Professor of Mathematical Biology at Arizona State University. His research focuses on the role of social landscapes on pathogens' disease evolution. Dr. Castillo-Chavez also investigates problems at the interface of homeland security and disease invasions and social processes. Additionally, he directs the MTBI/SUMS (Mathematical and Theoretical Biology Institute / Institute for Strengthening the Understanding of Mathematics and Science) and SUMS - MSHP (Mathematics Science Honors Program). These programs provide sequential research experiences, mostly to underrepresented minorities, and aim to increase the representation of US citizens and residents in fields that required strong quantitative training.

Problem of the week

Let p and q be positive numbers with $\frac{1}{p} = 1 - \frac{1}{q}$ and $p <= 1/2$. Show that

$$p + \frac{1}{2}p^2 + \frac{1}{3}p^3 + ... = q - \frac{1}{2}q^2 + \frac{1}{3}q^3 + ...$$

As always, solutions should be submitted to weimer@stolaf.edu.

Carlson Contest Solution

Solutions to some of the Carlson Contest Problems will appear in this column over the next few weeks.

Problem 2:
Three spheres of radius 1 are placed on the positive side of the xy–plane so that they are tangent to the xy–plane and also mutually tangent. A fourth sphere of radius 1 is placed above the xy–plane mutually tangent to the first three. What is the distance from the xy–plane to the fourth sphere?

Solution:
The centers of the four spheres form a regular tetrahedron of edge length 2. The altitude on any triangular face has length $\sqrt{3}$. The altitude from the top of the tetrahedron to the triangular base will intersect the altitude of the triangular base twice as far from the vertex as the edge. (There are many ways to prove this, but you can probably convince yourself of this fact by looking at the tetrahedron from the top.) Thus, the length of the altitude is

$$\sqrt{\sqrt{3}^2 - \left(\frac{\sqrt{3}}{3}\right)^2} = \sqrt{\frac{8}{3}}.$$ The bottom of the fourth sphere is a distance of one lower than the upper vertex of the tetrahedron, as is the xy-plane below the bottom face of the tetrahedron, thus the distance we are looking for is also $\sqrt{\frac{8}{3}}$.

End of Year MSCS Picnic

Mark your calendar for the end of year MSCS picnic!

When: Sunday, May 4th
Where: Sechler Park (off of Armstrong Road).
What: Lunch and afternoon fun!

Be on the look out for sign-up sheets and more information.

Joke of the week

A topologist is a person who doesn't know the difference between a coffee cup and a doughnut.