# *TCU Math News Letter*

## Volume 11, Number 5 February 2003

*The mind uses its faculty for creativity only when experience forces it to do so.*

--- Henri Poincaré

## Parabola Meeting

Parabola, the TCU undergraduate mathematics club, will hold its next meeting on Tuesday, February 18. The meeting will begin with refreshments at 3:30 p.m. in TTC, Room 300. At 4:00 p.m., Professor Ken Richardson of the TCU Mathematics Department will present the talk "Computing the Euler Characteristic" in TTC 138.

The talk should be accessible to undergraduates of all levels. The Euler characteristic is an integer associated to a surface, and it can be computed many different ways - geometrically, topologically, and analytically. In his talk, Professor Richardson will show that by analyzing the methods of calculating this number, we obtain surprising results that relate the geometry, topology, and analysis of surfaces. He will compute the Euler characteristic in some examples to illustrate these results. This analysis also applies to higher dimensional versions of surfaces called manifolds. If time allows, he will discuss some new results involving the generalizations of the Euler characteristic to foliations - that is, certain manifolds that are "layered".

## Seminar on Primality Testing

George Gilbert will give a seminar talk entitled "The Polynomial Time Algorithm for Testing Primality" at 3:30 p.m. on Tuesday, February 25, in Room 138 of the Tucker Technology Center. The 2002 discovery and proof of this algorithm by Indian mathematicians Manindra Agrawal, Neeraj Kayal, and Nitin Saxena is remarkably simple for such a much-sought-after result. Nevertheless, one should have at least Abstract Algebra I or an introductory number theory course to be able to follow the arguments. The talk will focus on their proof.

## Spring Career Night

The University Career Services office is sponsoring a Spring Career Night on Wednesday, February 19, 4 p.m.-7 p.m. in the Student Center Ballroom. Recruiters from various companies who are interested in hiring full-time employees and interns will be in attendance. All TCU students are invited to attend. Those students wanting to apply for jobs should dress professionally and bring several copies of their resume. A list of participating companies will be available the week of the event from University Career Services.

# Solution to December 2002 Problem of the Month

**Problem:** The ratio of the speeds of two trains is equal to the ratio of the times they take to pass each other going in the same or in opposite directions on parallel tracks. Find that ratio. (From Parabola.)

<div align="center">Solution</div>

Let $s_1 > s_2$ be the speeds of the trains and let $x_1$ and $x_2$ be their lengths. Note that they take longer to pass each other going in the same direction. Let $r = s_1/s_2$. Then the problem statement translates to

$$r = \frac{s_1}{s_2} = \frac{(x_1 + x_2)/(s_1 - s_2)}{(x_1 + x_2)/(s_1 + s_2)} = \frac{(s_1 + s_2)}{(s_1 - s_2)} = \frac{s_1/s_2 + 1}{s_1/s_2 - 1} = \frac{r+1}{r-1}.$$

Therefore, $r^2 - r = r + 1$, or $r^2 - 2r - 1 = 0$. Using the quadratic formula, we find that the positive root of this equation is $1 + \sqrt{2}$.

# Problem of the Month

Find the minimum volume of a right regular cone that can be circumscribed about the unit cube with one face of the cube in the base of the cone.

**Students and others are invited to submit solutions to Dr. George Gilbert (Math Dept. Office or P.O. 298900). Correct solutions submitted by persons who are not members of the TCU math faculty will be acknowledged in the next issue of the newsletter. Note that a correct solution is an answer and a justification of its correctness. The solution to the problem will be published in the next edition of the newsletter.**

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