TCU Math News Letter

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If science is viewed as an industrial establishment, then mathematics is an associated power plant which feeds a certain kind of indispensable energy into the establishment.

--- Salomon BochnerŽ

Editor: Dr. Rhonda Hatcher and Archive of Newsletters

TCU Lectureship Series

Professor Colin Adams of Williams College will be the next speaker in the TCU Lectureship Series. He will present the talk 'Mel Slugbate's Real Estate in Hyperbolic Space' in Tucker Technology Center 138 at 4 p.m. on Tuesday, March 25. His talk should be accessible to undergraduates of all levels. Professor Adams is well known for his highly entertaining teaching style. In 1998 he was awarded the Mathematical Association of America Deborah and Franklin Haimo national distinguished teaching award. His talk is being co-sponsored by Parabola, the TCU Undergraduate Mathematics club.

On April 1, 2002, Professor Sean Keal of the University of Texas at Austin will present the talk 'Compact Submanifolds of Moduli Spaces in Geometry' in the TCU Lectureship Series. Professor Keal's talk will be at 4 p.m. in Tucker Technology Center 138.

Both talks will be preceded by refreshments in TTC 300 at 3:00 p.m.

Seminar on Primality Testing Rescheduled

George Gilbert's seminar talk on 'The Polynomial Time Algorithm for Testing Primality' was cancelled last month because the university was closed due to weather conditions. It has been rescheduled for 3:30-5:00 p.m. on Tuesday, March 4, in Room 244 of the Tucker Technology Center. Refreshments will be served in TTC 300 from 3:00 to 3:30p.m. 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.

Mathematical Association of America Meeting

The Texas Section of the Mathematical Association of American will be holding its annual meeting on April 3-5, 2003 at Sam Houston State University in Huntsville, Texas.

Of particular interest to undergraduates is the MAA Address by Underwood Dudley of DePauw University, to be presented at 1:10 p.m on April 4. His talk is entitled 'Why Teach Mathematics?' A Student Paper Session is scheduled for the afternoon of April 4, from 2:30-5:00 p.m., followed by a Student Pizza and

Puzzle Party at 5:30 pm.

Undergraduates interested in learning more about this meeting should contact Professor Rhonda Hatcher in TTC 314 or by e-mail at r.hatcher@tcu.edu.

Solution to February 2003 Problem of the Month

Problem: 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.

Solution:
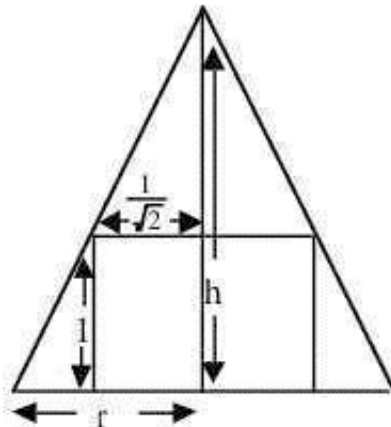
Let r be the radius of the cone and let h be its height. The volume of the cone is $V = \frac{\pi}{3} r^2 h$. Consider the cross section containing the vertex of the cone, the center of its base, and one of the two diagonals of the top (or bottom) of the cube. By similar triangles we have $\dfrac{h-1}{h} = \dfrac{1/\sqrt{2}}{r}$, or

$$h = \frac{\sqrt{2}r}{\sqrt{2}r - 1}, \text{ hence } V = \frac{\pi\sqrt{2}}{3} \frac{r^3}{\sqrt{2}r - 1}, \quad \frac{1}{\sqrt{2}} < r \text{ Differentiate } V \text{ to get}$$

$$V' = \frac{\pi\sqrt{2}}{3} \frac{2\sqrt{2}r^3 - 3r^2}{\left(\sqrt{2}r - 1\right)^2}. \text{ The only critical point in the domain is } r = 3/2\sqrt{2}. \text{ As } r$$

goes to $1/\sqrt{2}$ or to ∞, V becomes infinite, so the minimum volume is $V(3/2\sqrt{2}) = 9\pi/8$. This month's problem was solved by Alissa Grissom.

March 2003 Problem of the Month

This month's problem is due to John M. Howell and appeared in the Pi Mu Epsilon journal several years ago. Find all solutions in integers to $2^n = n^k$.

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.