TCU Math Newsletter

The true traditional doughnut has the topology of a sphere. It is a matter of taste whether one regards this as having separate internal and external surfaces. The important point is that the inner space should be filled with good raspberry jam. This is also a matter of taste.

- P. B. Fellyett

Frank Stones Colloquium Talk

The next speaker in the Frank Stones Colloquium talk series will be Professor Susan Minkoff of the University of Dallas. Her talk will be on Friday, November 15 at 3:30 pm in TUC 352 with refreshments at 3:00 pm in TUC 300. The title and abstract will be posted soon on the TCU Math Department webpage at http://www.math.tcu.edu/talks.html.

Abstract Algebra I Moved to the Spring Semester at TCU

Beginning with the Spring 2014 semester, Abstract Algebra I will be offered in the spring rather than the fall semester. Real Analysis I will continue to be offered in the fall semester. Students should take this into consideration in planning their degree plans. A 4-year schedule of the regular mathematics course offerings at TCU is posted on the department web page at http://www.math.tcu.edu/schedule4year.pdf. There will also normally be other upper level courses offered in addition to those on the schedule. In particular, MATH 50323 Differential Geometry and MATH 40663 Numerical Analysis will be offered in the Spring 2014 semester.

November Actuarial Talk

A representative from Mercer will present the actuarial talk "Opportunities in Actuarial Consulting" Wednesday, November 20 at 3:30 pm in TUC 352 with refreshments at 3:00 pm in TUC 300. Mercer is one of the largest global consulting firms with company locations in over 35 countries.

The TCU actuarial talk series features talks of particular interest to students in the actuarial program. Also, many of the talks are useful in general for any students interested in careers in industry or finance.

TCU Career Network Webinar on November 6

The TCU Career Speaker Series in November features author Melissa Giovagnoli, and is on Wednesday, November 6 from 7:00 to 8:00 pm. In the webinar, you can learn how to effectively use social media in your job search. The webinar is free to all TCU students, alumni, faculty and staff. Visit www.careers.tcu.edu to register for it and for more information.
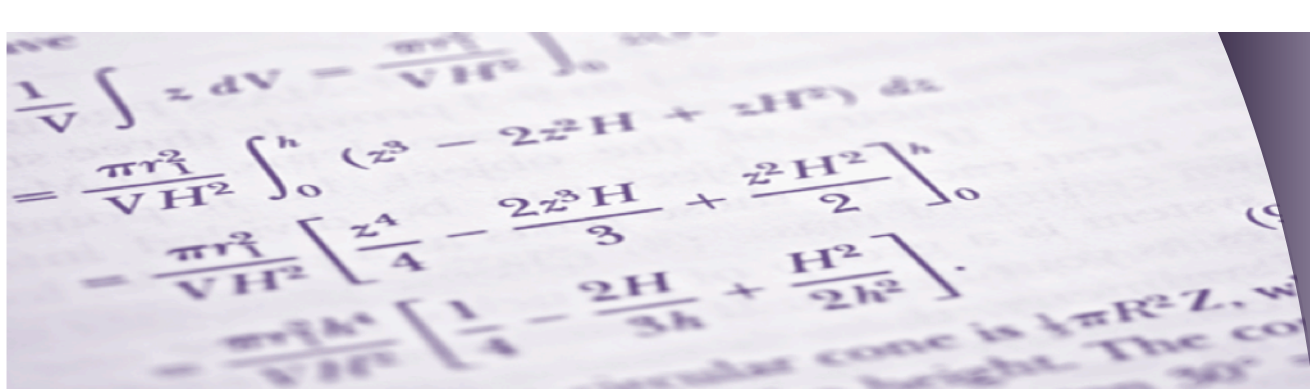
Solution to the October 2013 Problem of the Month

Problem: A solid has a cylindrical middle with a conical cap at each end. The height of each cap equals the length of the middle. For a given surface area, what shape maximizes the volume? (1st Putnam competition)

Solution: Let the cylinder have radius r and length h. We wish to maximize the volume $\pi r^2 h + 2 \cdot \frac{1}{3}\pi r^2 h = \frac{5}{3}\pi r^2 h$ or, equivalently $r^2 h$. The surface area is $2\pi r h + 2 \cdot \frac{2\pi r}{2\pi\sqrt{r^2+h^2}} \cdot \pi(r^2 + h^2) = 2\pi(rh + r\sqrt{r^2 + h^2})$ and so $rh + r\sqrt{r^2 + h^2} = c$ for some constant c. Subtracting rh from both sides of this equation and squaring, we find $h = (c^2 - r^4)/(2cr)$. We want to maximize $f(r) = \frac{c}{2}r - \frac{1}{2c}r^5$ on the domain $0 < r < \sqrt{c}$. We have $f'(r) = \frac{c}{2} - \frac{5}{2c}r^4$ with critical number $r = \sqrt{c}/\sqrt[4]{5}$ in the domain. It gives a maximum by the first or second derivative test. The corresponding length is $h = 2\sqrt{c}/\sqrt[4]{125}$.

The October Problem of the Month was solved by Brad Beadle ('96).

November 2013 Problem of the Month

This month's problem is derived from a problem from the early years of the Indiana College Mathematics Competition. The real number

$$\sqrt[3]{25 + 10\sqrt{5}} + \sqrt[3]{25 - 10\sqrt{5}}$$

looks very irrational until you punch it into a calculator. Is it really an integer?