

TCU Math Newsletter

God created infinity, and man, unable to understand infinity, created finite sets.

- Gian-Carlo Rota

TCU Math Course Offerings

In addition its regular Fall 2017 offerings, the TCU Mathematics Department will offer Modern Fourier Analysis and Topology in the Fall 2017 semester. Also, the History of Mathematics will be offered in Fall 2017, but not in Spring 2018.

The Mathematics Department web site has a list of anticipated course offerings for the next four years at

<http://mathematics.tcu.edu/wp-content/uploads/2016/03/Schedule.pdf>

2017 TCU Student Research Symposium (SRS) Abstracts Due on March 23

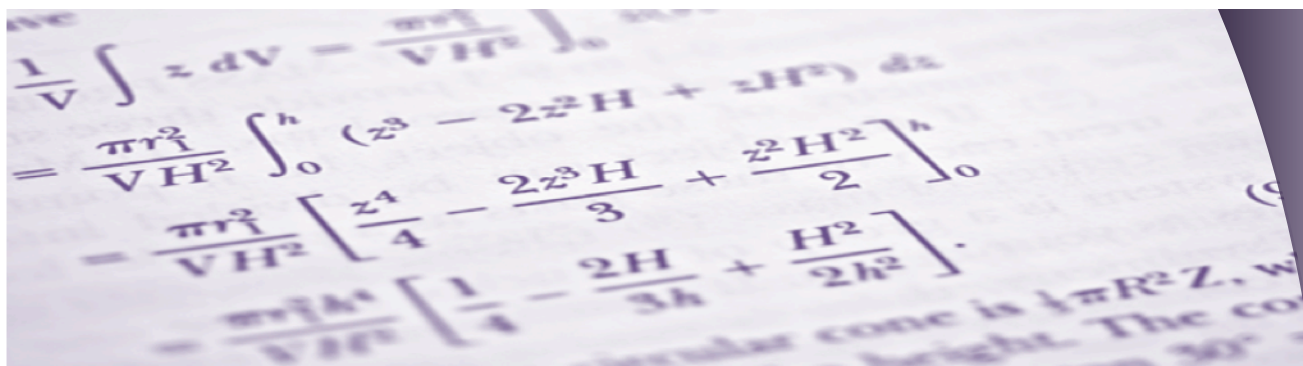
TCU undergraduate and graduate students are invited to display their research at the Student Research Symposium (SRS). Any science, engineering, or mathematics student involved in research is encouraged to give a poster presentation at this event. Students wishing to do a poster presentation at SRS must submit an electronic abstract by Thursday, March 23. The poster electronic submission deadline is April 6, 2017.

More information about SRS can be found at <http://www.srs.tcu.edu>.

Applications for 2017-2018 SERC Undergraduate Research Grants Due March 31

The TCU Science and Engineering Research Center (SERC) will be awarding research grants for the 2017-2018 academic year to undergraduate students engaged in research with faculty in the TCU College of Science and Engineering. The grants will range from \$500 to \$1500 depending on the needs of the proposed research project. Student applicants must have junior or senior standing with anticipated graduation in May 2018 or later, although exceptions can be made for highly qualified sophomores with the recommendation of a faculty mentor.

The application form for the SERC Undergraduate Research grants and additional information is available on the SERC web site www.serc.tcu.edu. Students interested in applying should contact a faculty member in the college to see if he or she would serve as a faculty mentor, and be sure to apply by the March 31, 2017 at 4:00 pm deadline.



Solution to the February 2017 Problem of the Month

Problem: Let $p(x)$ be a real polynomial of degree 2. Show that, for n a sufficiently large positive integer,

$$\frac{d^n}{dx^n}(p(x)e^x)$$

has two real roots.

Solution: Let $p(x) = ax^2 + bx + c$. An easy induction shows that

$$\frac{d^n}{dx^n}(p(x)e^x) = (x^2 + (2na + b)x + ((n^2 - n)a + nb + c))e^x.$$

The function has two real roots if and only if the discriminant of the quadratic is positive. The discriminant is

$$(2na + b)^2 - 4a((n^2 - n)a + nb + c) = 4a^2n + b^2 - 4ac,$$

which is clearly positive for n sufficiently large.

For $p(x)$ be a real polynomial of degree d , the derivative will have d real roots for n sufficiently large. As n increases, the roots converge to those of a family of Hermite polynomials. The proof is much harder.

This month's problem was solved by Brad Beadle ('96), and Peter and Roger Bevan.

March 2017 Problem of the Month

Let n be a positive integer that is not divisible by the cube of any prime number. Show that n^2k is not a perfect cube for $k = 1, 2, \dots, n - 1$.

Students and others are invited to submit solutions to Dr. George Gilbert by e-mail (g.gilbert@tcu.edu) or hard copy (Math Dept. Office or TCU Box 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.

Editor: Rhonda Hatcher
 Problem Editor: George Gilbert
 Thought of the Month Editor: Robert Doran