Vol 31 No 1
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TCU Math Newsletter

One merit of mathematics few will deny: it says more in fewer words than any other science. The formula $e^{i\pi} = -1$ expressed a world of thought, of truth, of poetry, and of the religious spirit "God eternally geometrizes."

- David Eugene Smith

TCU Math Club Meeting on September 1

The first meeting of the year of the TCU Math Club meeting will be on Thursday, September 1 at 5:00 pm in TUC 300. The meeting will provide information about the Math Club. There will also be a small origami project and snacks. Membership in the TCU Math Club is open to all TCU students. You can join the TCU Math Club on engage.tcu.edu, and follow @tcumathclub on Instagram to stay up-to-date on meetings. For more information, contact the current president Maithili Bhate at MAITHILI.BHATE@tcu.edu.

Symposium for Undergraduate Research Exploration on November 10-11

The University of Texas Austin is hosting their annual Symposium for Undergraduate Research on their campus on November 10-11. The symposium is intended for junior or senior undergraduates doing research in science or math and considering applying to graduate school.

The symposium provides opportunities for students to practice presenting their research, to learn about the graduate school experience, and to get a start on building their professional network For successful applicants, the symposium includes travel funds, lodging, and food.

For more information, you can contact Dr. Scott Burghart at sburghart@austin.utexas.edu or (512) 232-1074. You can apply for the symposium at http://txsci.net/sureapp.

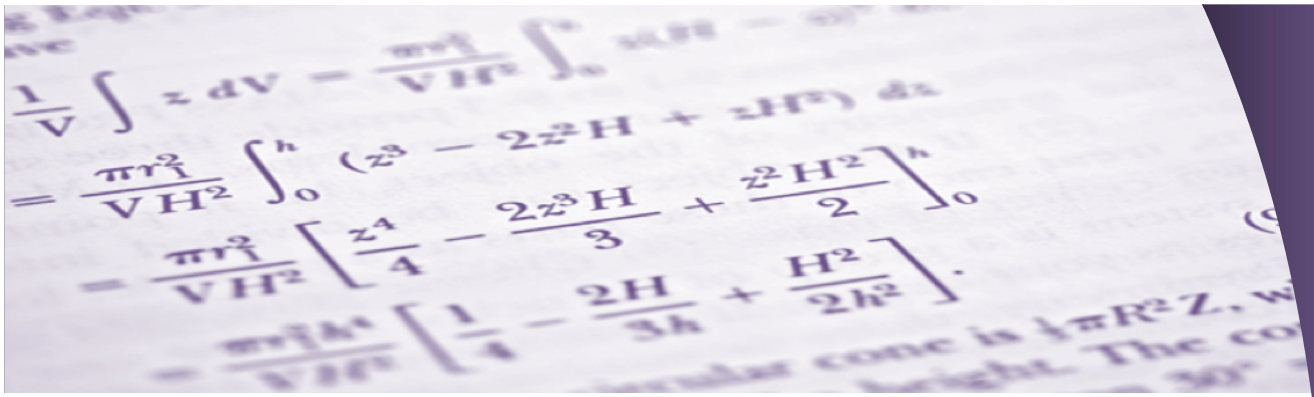
Gamma Iota Sigma Speaker on August 29

Gamma Iota Sigma (GIS) is a collegiate professional fraternity that promotes, encourages, and sustains student interest in insurance, risk management, and actuarial science as professions. All TCU students are welcome to participate. Linh (Lily) Ta is the incoming GIS president, and Dr. Staples is the faculty advisor.

The first GIS event of the fall semester will feature a national speaker, Adrian Corredoira, on August 29 at 4:00 pm in TUC 139. He is expected to give a general talk on actuarial science.

TCU Math Clinic

The TCU Math Clinic offers free drop-in tutoring for TCU undergraduates taking math classes. The Math Clinic for Fall 2022 will be in person in TUC 240, or via Zoom. The Math Clinic hours, tutors, and Zoom link can be found at https://cse.tcu.edu/mathematics/undergraduate/tcu-math-clinic.php.



Solution to the April 2022 Problem of the Month

Problem: Evaluate $\lim_{x\to\infty}((x+1)(1+1/x)^x - ex)$.

Solution: The limit is $e/2$.

We recall that $\lim_{x\to\infty}(1+1/x)^x = e$. This is provable by expressing $(1+1/x)^x$ as $e^{ln(1+1/x)/(1/x)}$ and computing limit of the exponent using L'Hôpital's rule. (This points out the danger of attempting to compute indeterminate limits in pieces; one might think the limit in the problem is e.)

We apply L'Hôpital's rule twice,

$$\lim_{x\to\infty}(x+1)(1+1/x)^x - ex = \lim_{x\to\infty}\frac{(1+1/x)^{x+1} - e}{1/x}$$

$$= \lim_{x\to\infty}\frac{(1+1/x)^{x+1}(\ln(1+1/x) - 1/x)}{-1/x^2}$$

$$= \lim_{x\to\infty}(1+1/x)^{x+1}\cdot\lim_{x\to\infty}\frac{\ln(x+1) - \ln x - 1/x}{-1/x^2} = e\cdot\lim_{x\to\infty}\frac{1/(x+1) - 1/x + 1/x^2}{2/x^3}$$

$$= e\cdot\lim_{x\to\infty}\frac{x^3}{2x^2(x+1)} = \frac{e}{2}.$$

The Problem of Month was solved by Duc Toan Nguyen and Maiyu Diaz (graduate student).

September 2022 Problem of the Month

This month's problem came from an inequality Professor Efton Park encountered in his research. Find all pairs of real numbers that solve $|x| = |y| + |x-y| + |y|\cdot|x-y|$.

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
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