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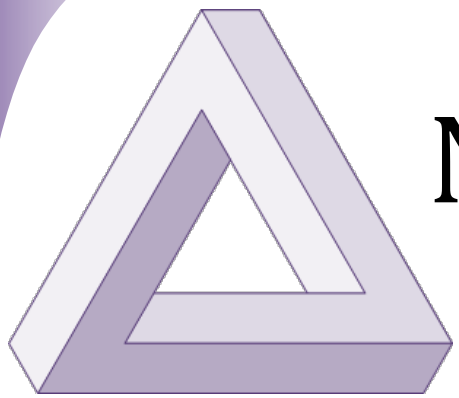
TCU Math Newsletter



Mathematics is not a deductive science — that's a cliché. When you try to prove a theorem, you don't just list the hypotheses, and then start to reason. What you do is trial and error, experimentation, guesswork. You want to find out what the facts are, and what you do is in that respect similar to what a laboratory technician does.

– Paul Halmos

Actuarial Career Event at TCU on September 19

On Wednesday, September 19, TCU will host an Actuarial Career Event in TUC 139 from 12:00 pm to 2:00 pm. Eleven actuarial firms will be in attendance to offer career and internship information. Last year many students received job offers as a result of this event.

All actuarial students and any other students interested in this career option should attend this event. For more information, contact Dr. Susan Staples at s.staples@tcu.edu.

Putnam Mathematics Contest

The 79th Annual William Lowell Putnam Mathematical Competition will be held on Saturday, December 1, 2018, from 9:00 am to noon and 2:00 to 5:00 pm. The questions require different levels of mathematical background, and all require a bit of ingenuity to solve. The scores on the exam are typically quite low, and even answering a couple of questions is considered an excellent performance. The competition is open to undergraduates enrolled in colleges and universities of the United States and Canada who have not yet received a college degree. For more information about the contest visit http://math.scu.edu/putnam/. Students interested in signing up to take the Putnam exam this year should contact Professor George Gilbert at g.gilbert@tcu.edu by the end of the day on Monday, October 8.

Frank Stones Colloquium Talk

The first talk in the Frank Stones Colloquium Series this year will be presented by Professor Christina Graves of the University of Texas at Tyler. The talk will be on Friday, September 14 in TUC 244 from 3:30 to 4:30 pm.

TCU students and members of the community are invited to attend the colloquium talks and the refreshments served in TUC 300 during the half hour before the start of each talk.

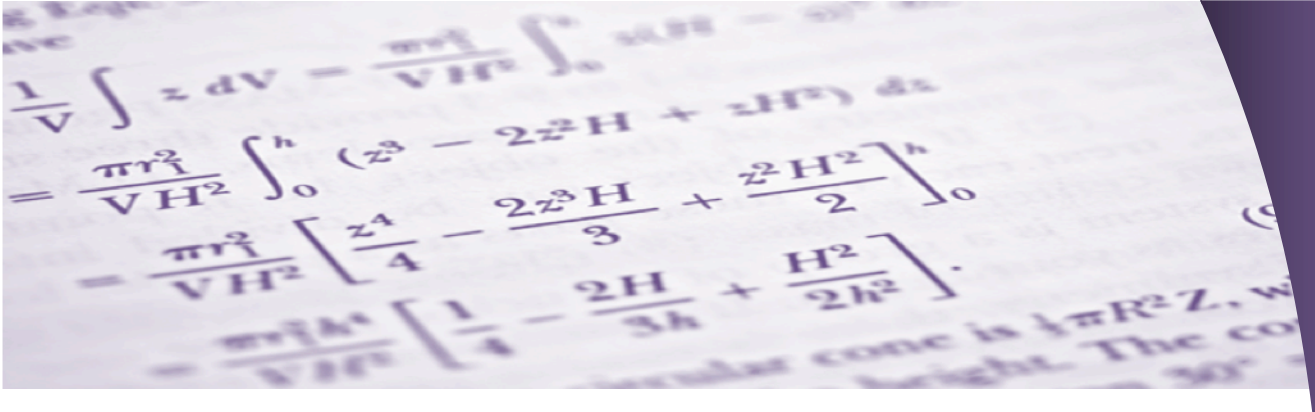
Mathematics Department Online Résumé Book Deadline is September 12

Mathematics Department annual online résumé book will be prepared soon. This résumé book is for mathematics majors, and it is often used to connect students to job offerings when companies contact TCU.

Students must make an appointment with Gabriela Pineider to have their résumé reviewed in order to be included in the book. Her email address is gabriela.pineider@tcu.edu.

SERC Undergraduate Research Grant Applications Due September 21

The TCU Science and Engineering Research Center (SERC) is now accepting applications for the Fall 2018 round of SERC Undergraduate Research Grants. The grants range from $500 to $1500. The application form and more information about the research grants are available at www.serc.tcu.edu. The application submission deadline is Friday, September 21, 2018 at 4:00 pm.



Solution to the April 2018 Problem of the Month

Problem: For what $b > 0$ is $xb^{-1/x} - x + 1 > 0$ for all $x > 0$?

Solution: The inequality holds for $b \leq e$.

Setting $y = 1/x$ and multiplying through by yb^y yields the equivalent inequality $f(y) = (y-1)b^y + 1 > 0$ for all $y > 0$. This inequality is clear for $y \geq 1$.

For $b \leq 1$ and $y < 1$, we have $f(y) > (-1) \cdot 1 + 1 = 0$.

To treat the case $b > 1$ and $y < 1$, we compute $f'(y) = [y \ln b - (\ln b - 1)]b^y$, with minimum at $z = 1 - 1/\ln b$. For $1 < b \leq e$, this z is non-positive, hence $f(y) > f(0) = 0$ for all $y > 0$. For $e < b$, this critical point satisfies $z > 0$ and has a minimum value of $1 - b/(e \ln b)$. The derivative of $b/\ln b$ is positive for $b < e$; we conclude this minimum value is less than $1 - e/(e \ln e) = 0$.

This month's problem was solved by Brad Beadle ('96).

September 2018 Problem of the Month

Find all pairs of positive integers such that the difference of their least common multiple and their greatest common divisor equals their difference.

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