Vol 31 No 6
April 2023

TCU Math Newsletter

Experience enables you to recognize a mistake when you make it again.

- Frank P. Jones

Calculus Bee on Tuesday, April 18

The annual TCU Mathematics Department Calculus Bee will be held on Tuesday, April 18 at 5:00 pm in TUC 244. The material covered is Calculus I and II, but not beyond the material that current Calculus II students have had. All TCU undergraduates are eligible to compete. TCU bookstore gift cards will be awarded to the top three finishers, with $100 for first place, $75 for second place, and $50 for third place.

TCU Math Club T-shirts

The TCU Math Club will be selling shirts as a fundraiser! The price should be around $15-20. There will soon be a link to where people can complete the purchase online, but for now if you are interested in purchasing one, you can contact Dr. Emily Herzig at E.HERZIG@tcu.edu for more information.

Brandon Isensee Honored as TCU Mathematics Department Senior Scholar

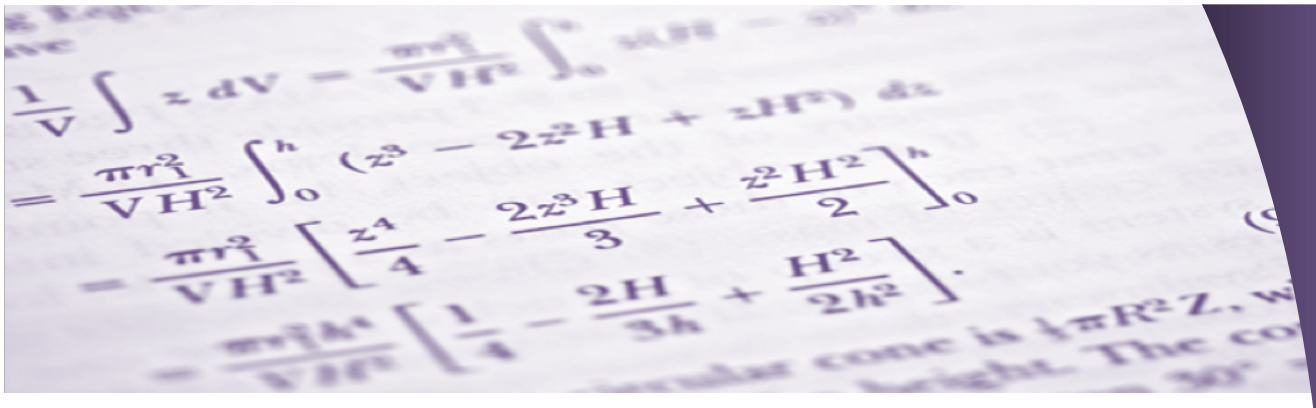
Brandon Isensee has been named the 2023 TCU Mathematics Department Senior Scholar. The winner of the award is determined by a vote of the Mathematics Department Faculty.

Pi Mu Epsilon Initiation

Several TCU students will be initiated into the mathematics honor society Pi Mu Epsilon on May 2, 2023. The students being initiated are Micah Collins, Avery Harrington, Mia Jackson, Jackson Keese, Nhu Le, Vinh Ly, Grace McCurdy, Sy Neeley, Duc Toan Nguyen, Julia Nguyen, Khanh Pham, Ashley Russell, Annika Sellke, and Emile Zabaneh.

Student Research Symposium

The Michael and Sally McCracken Annual Student Research Symposium (SRS) will be held on Friday, April 28, 2023. The purpose of the Student Research Symposium is to showcase both undergraduate and graduate science research in a relaxed, interdisciplinary setting. The posters will be on display in the Tucker Technology Center all day.



Solution to the March 2023 Problem of the Month

Problem: Show that $(x+3)^{x+3}x^x > (x+2)^{x+2}(x+1)^{x+1}$ for all positive x.

Solution: We show, equivalently, that $f(x) = \frac{(x+3)^{x+3}x^x}{(x+2)^{x+2}(x+1)^{x+1}} > 1$ for all positive x. By logarithmic differentiation,

$$f'(x) = f(x)\frac{d}{dx}\big((x+3)\ln(x+3) + x\ln x - (x+2)\ln(x+2) - (x+1)\ln(x+1)\big)$$

$$= f(x)(\ln(x+3) + \ln x - \ln(x+2) - \ln(x+1)) = f(x)\ln\frac{x^2+3x}{x^2+3x+2} < f(x)\ln 1 = 0,$$

so f is decreasing. Because

$$\lim_{x\to\infty} f(x) = \lim_{x\to\infty}\frac{x+3}{x+1}\cdot\frac{\left(1+\frac{1}{x+2}\right)^{x+2}}{\left(1+\frac{1}{x}\right)^{x}} = 1\cdot\frac{e}{e} = 1,$$

$f(x) > 1$ for all positive x.

April 2023 Problem of the Month

There are lines tangent to both of the parabolas $y = x^2 - x + 9$ and $y = -5x^2 - 7x$. Find them.

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