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TCU Math Newsletter

The opposite of a correct statement is a false statement. But the opposite of a profound truth may well be another profound truth.

- Niels Bohr

Calculus Bee on Zoom on Thursday, April 22

The annual TCU Mathematics Department Calculus Bee will be held on Thursday, April 22 at 6:30 pm – 7:30 pm via Zoom. 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. Gift cards will be awarded to the top three finishers, with $100 for first place, $75 for second place, and $50 for third place.

To register for the Calculus Bee go to the link: https://tcu.zoom.us/meeting/register/tJAuduurrzoiHNIXGpoP8U1NH5C5J8uhCZkQ.

There is not a deadline for registering but be sure to do so at least right before 6:30 pm on April 22.

Lauren Nagel Named the 2021 TCU Mathematics Department Senior Scholar

Lauren Nagel has been named the 2021 TCU Mathematics Department Senior Scholar. The winner of the award is determined by a vote of the Mathematics Department faculty.

Math Majors Inducted into Pi Mu Epsilon and Phi Beta Kapa

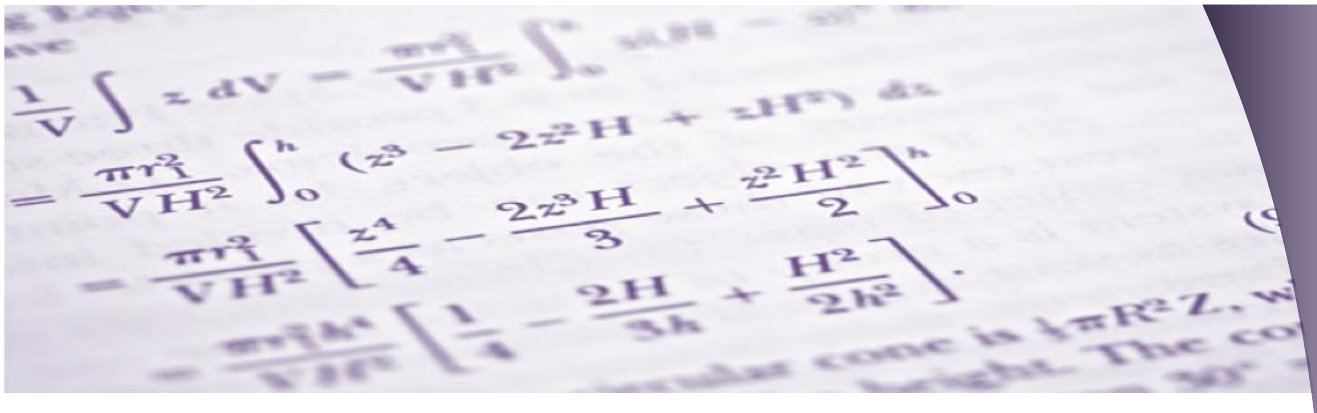
Math majors Matthew Bolding, Bailey Campbell, Alex Cleveland, Harry Daniels, Hudson Dees, Nicole Glaser, Diep Ho, Jacie Mascarenhas, Griffin McPherson, and Hoang Long Nguyen will be initiated into the mathematics honor society Pi Mu Epsilon this semester.

Rebecca Port and Brent Hewitt are math majors who will be inducted in the Phi Beta Kappa, founded in 1776 and the oldest academic honor society in the United States.

Congratulations to all of these excellent students!

Planned Course Information Available on TCU Mathematics Department Web Site

When registering for mathematics classes , it is helpful to take a look at the planned mathematics course offerings through Spring 2024. They are posted on the Mathematics Department web site at https://cse.tcu.edu/mathematics/files/2021/ScheduleS2021.pdf.



Solution to the March 2021 Problem of the Month

Problem: (due to Brad Beadle) Show that it is possible to estimate the smallest angle of a triangle drawn on a piece of paper to within 1 degree using a ruler and a simple calculator, under the constraint that each of the basic operators +,-,*,/ is used at most once. No additional marks are allowed on the paper, and you may assume that measurements with the ruler are exact.

Solution: Let the smallest angle measure θ degrees. Mark equal lengths a from its vertex. Let the length of the third side of the triangle formed be $c \leq a$. By the law of cosines, $\cos\theta = 1 - \frac{c^2}{2a^2}$. Our solution is motivated by the first two terms of the series expansion for cosine, which is in terms of radians, leading to the approximation $\theta \approx \frac{180c}{\pi a}$. Unfortunately, this an underestimate by more than 1 degree for $\theta \geq 43$. However, we can show that $59.3c/a$ is within 1 degree of the true angle. Let $x = c/a$. Then

$$f(x) = \theta - 59.3x = \frac{180}{\pi}\arccos(1 - x^2/2) - 59.3x,$$

$$f'(x) = \frac{180x}{\pi\sqrt{1-(1-x^2/2)^2}} - 59.3,$$

with relevant critical point $x_0 = 2\sqrt{1-\left(\frac{180}{59.3\pi}\right)^2}$. We find $f(x_0) \approx -0.69595625$, $f(0) = 0$, and $f(1) = 0.7$. Therefore, $|f(x)| \leq 0.7 < 1$, as desired.

April 2021 Problem of the Month

What is the expected number of rolls of a fair die until all six faces have been rolled at least once?

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.

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