# TCU Math Newsletter

*There are two ways to do great mathematics. The first is to be smarter than everybody else. The second way is to be stupider than everybody else — but persistent.*

*- Raoul Bott*

## TCU Math Club Meetings on October 4 and 19

The TCU Math Club will hold two meetings in October. The first will be on Monday, October 4 at 7:00 pm in TUC 244. It will feature a team competition. The Math Club will also meet on Tuesday, October 19 at 7:00 pm in TUC 352. This meeting will feature a Halloween talk by Dr. Igor Prokhorenkov followed by an outdoor reception.

The TCU Math Club is an undergraduate student organization for students interested in mathematics. The Math Club's focus is on math talks, math challenges, and math fun. The 2021 president is McGilley Simons. If you would like to join, contact McGilley at K.M.SIMONS@tcu.edu.

## Texas Undergraduate Mathematics Conference to be Held Online on Saturday October 30

The sixteenth annual Texas Undergraduate Mathematics Conference will be an online conference this year. It will be on Saturday, October 30 at 9:00 am to 3:00 pm. The conference provides an opportunity for undergraduates to give mathematical talks, play games, and network with students and faculty from around the state of Texas. Registration for the conference is free.

Undergraduates who would like to present a talk at the conference must submit an abstract of the talk by October 15.

The plenary speaker for the conference is Dr. Shanise Walker, Assistant Professor of Mathematics, University of Wisconsin-Eau Claire. She will be presenting the talk "The Game of Cycles."

For information about the conference, to register for the conference, or to submit an abstract go the website http://sections.maa.org/texas/tumc.

## Putnam Mathematics Contest

The 82nd Annual William Lowell Putnam Mathematical Competition will be held on Saturday, December 4, 2021, 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 https://www.maa.org/math-competitions/putnam-competition. This site includes a link to register electronically. Students should register no later than December 2. If you have questions, please contact Dr. George Gilbert at g.gilbert@tcu.
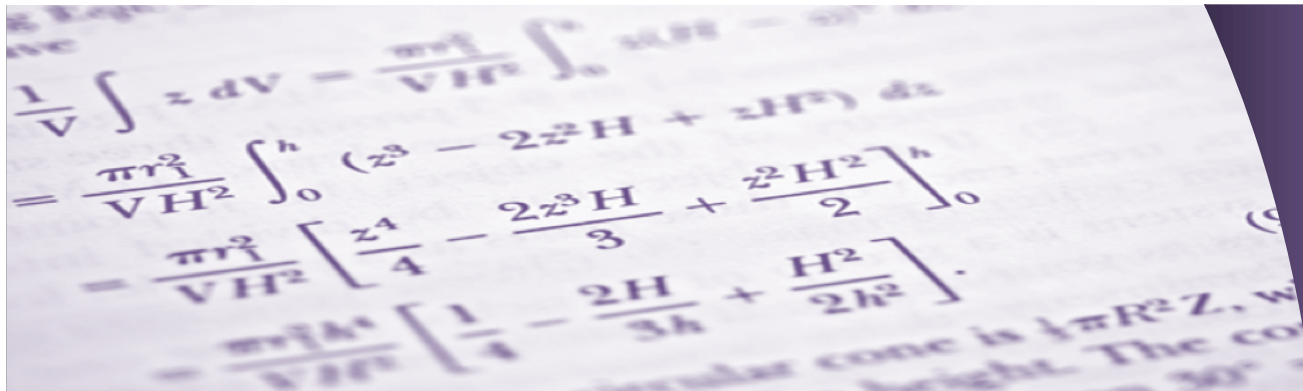
# Solution to the September 2021 Problem of the Month

**Problem:** Let $n$ be a positive integer. Prove that $\sin nx / \sin x \leq n$ whenever it is defined.

**Solution:** We prove the stronger result that $|\sin nx / \sin x| \leq n$ whenever it is defined.

The claim is trivial for $n = 1$. We assume it is true for $n$ and proceed by induction. By the addition law for sines,

$$\left| \frac{\sin(n+1)x}{\sin x} \right| = \left| \frac{\sin nx \cos x + \sin x \cos nx}{\sin x} \right| \leq \left| \frac{\sin nx}{\sin x} \right| \cdot |\cos x| + |\cos nx|$$
$$\leq n \cdot 1 + 1 = n + 1.$$

The Problem of Month was solved by Duc Toan Nguyen.

# October 2021 Problem of the Month

Professor Efton Park ran into this problem recently. It goes back to an old Moscow Mathematical Olympiad. The faces of a polyhedron are all convex polygons (all interior angles less than 180°). Is it possible for each face to have a different number of sides?

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.