

# PROBLEM OF THE MONTH #2

FEBRUARY 2022

**Directions:** Write a complete solution to the problem below showing all work. Your paper must have your name, W#, and Southeastern email address. Solutions are to be sent as a SINGLE PDF FILE to the submission address [talwissubmissions@selu.edu](mailto:talwissubmissions@selu.edu), with the subject heading of the email as Problem of the Month #2, February 2022, by 11:59 p.m., **Friday, February 25**. No late papers will be accepted.

All papers with a correct solution will be entered in a drawing for a great prize! Anyone can submit solutions, but only currently enrolled students are eligible for prizes.

Questions concerning the problem of the month should be sent to either Dr. Tilak de Alwis ([tdealwis@selu.edu](mailto:tdealwis@selu.edu)), or Dr. Dennis Merino ([dmerino@selu.edu](mailto:dmerino@selu.edu))

## **PROBLEM: *Inverse Tangent Functions and Limits***

(a) Find the exact value of  $\lim_{x \rightarrow 1} \frac{\pi - 4 \operatorname{Arctan} x}{x - 1}$  without using L'Hospital's Rule. You can use any other method learned in Calculus I, Trigonometry, or Algebra courses.

(b) Suppose  $a$  and  $b$  are rational numbers such that  $\operatorname{Arctan} \left( \frac{\sin 77}{1 - \cos 77} \right) = a + b\pi$ . Find the exact value of  $\frac{a + b}{a - b}$ .

**Note:** Partial answers might still be considered. So all submissions are welcome!