PROBLEM OF THE MONTH #2

OCTOBER 2023

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, with the subject heading of the email as Problem of the Month #2, October 2023, by 11:59 p.m., **Tuesday, October 31**. 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), or Dr. Dennis Merino (dmerino@selu.edu)

PROBLEM: *Exponetially Satisfying!*

(a) Find the exact and real solutions of the exponential equation $4^x - 6^x = 9^x$ by hand. Provide the exact and simplified answer in the form $\frac{\ln(a)}{\ln(b)}$ where *a* and *b* are some positive real numbers.

(b) Find the exact and real solutions of the exponential equation by hand:

$$256^x + 64^x.3^{1+x} = 4^x.3^{3x+1} - 81^x$$

Provide the simplified answer.