Problem of the Week
Number Seven
March 20, 2017

Since I've temporarily run out of algebra propaganda, how about a classic logical paradox?

A student was learning the law from his professor. They had agreed that the professor would not be paid for his work until the student won his first case. The student, however, did not want to pay. So, after completing his training, the student steadfastly refused to take a single case.

Outraged, the professor sued for the money he felt he was owed. He reasoned that if he won the lawsuit, then his student would have to pay, since that was precisely what the lawsuit was about. If instead he lost the suit, then his student would have won his first case and would again have to pay. Either way, the student has to pay!

The student, for his part, reasoned that if he won the lawsuit, then he did not have to pay, since whether or not he had to pay was precisely the subject of the suit. But if he lost the suit then he would not yet have won his first case, so again he would not have to pay. Either way, he would not have to pay!

Trippy, no? Isn't logic fun?

And speaking of fun, here is this week's problem. It has more of a geometric flavor than our other offerings this term, but you might find the most straightforward approach to a solution is, in keeping with the theme of this term, algebraic.

Suppose a certain parallelogram has three of its vertices at the points $(0, 0)$, $(3, 0)$ and $(4, 4)$. Find all three of the possibilities for the location of the fourth vertex.

When you think you have the problem figured out, follow the instructions below.

Submissions are due to Jason Rosenhouse by 5:00 on ***Friday, March 24.*** *Solutions, complete with a brief explanation, should be written on the back of an official POTW handout. Place your name, e-mail address, and the section numbers and professors of any math courses you are taking, in the* ***upper right corner*** *of the front of the page. One weekly winner will receive a five-dollar gift card from Starbucks. Solutions will be posted at the POTW website:*

http://educ.jmu.edu/∼rosenhjd/POTW/Spring17/homepage.html