
Problem of the Week

Number Four

February 13, 2017

Since we had some fun last week discussing radicals, I figured this week I would go for the biggest, baddest radical problem I could find. This problem showed up on a mathematics competition I participated in during high school. It was problem five in a list of six problems that had to be done within thirty minutes. I couldn't make heads or tails of it at the time. With only about ten minutes left, and with problem six looking like a doable geometry problem, I just skipped this and moved on. After the exam I learned that a friend of mine on the team had gotten the right answer, and I asked her how she did it. She replied that she didn't know how to solve it either, but reasoned that this was probably one of those problems math competitions love, where a ludicrously complex expression simplifies down to something nice. So she took a complete guess about what that something was, and by sheer dumb luck guessed right.

Of course, no points to you for guessing! Do not bother handing in a solution unless you have carefully justified your answer. Here is this week's problem:

Find the (simplified) value of k for which the larger root of the equation $x^2 + 4x + k$ is

$$\left(\sqrt{2 + \sqrt{3}}\right) \left(\sqrt{2 + \sqrt{2 + \sqrt{3}}}\right) \left(\sqrt{2 + \sqrt{2 + \sqrt{2 + \sqrt{3}}}}\right) \left(\sqrt{2 - \sqrt{2 + \sqrt{2 + \sqrt{3}}}}\right)$$

Keep in mind that when using the square root sign, it is understood that it is the positive square root that is intended.

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

*Submissions are due to Jason Rosenhouse by 5:00 on **Friday, February 17**. 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>