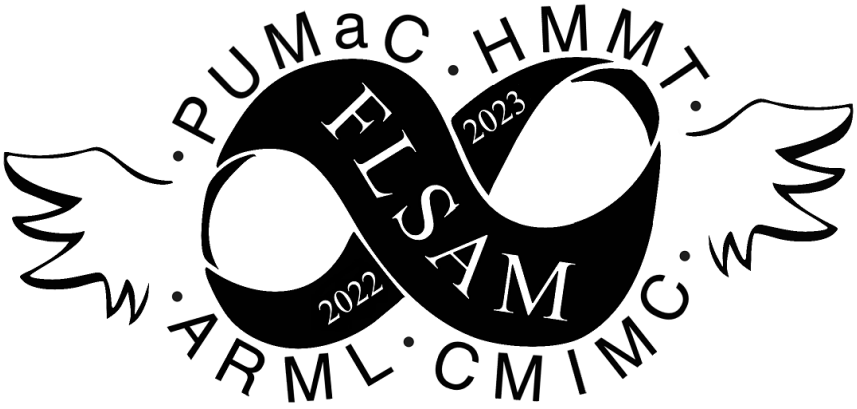
Florida Student Association of Mathematics



2024 FLSAM PUMAC Tryout

October 26-27, 2024

Round 1: Algebra

Welcome to the **2024 FLSAM PUMAC Tryout!** This is round one of four, each of which will consist of four problems to be completed in 30 minutes. Scoring is simply based on correct answers; there is no penalty for wrong answers. Good luck!

1. Consider polynomial $x^3 + kx^2 - 40x + 71$ with roots r, s, t. Compute the minimum value of $(r-s)^2 + (s-t)^2 + (t-r)^2$.

2. Compute

$$\sum_{n=1}^{\infty} \frac{n^2 + 2n + 3}{n(n+1)(n+2)(n+3)}.$$

3. Compute the least real number r such that

$$\prod_{i=0}^{n} (2\cos(2^i\theta) - 1) \leq r$$

over all $0 < \theta < \arccos\left(\frac{1}{2024}\right)$ and positive integers n.

4. Let n be the number of polynomials $P(x)$ with complex coefficients such that $\deg(P) < 11$ and

$$x^{12} - x \mid P(x)^{12} - P(x).$$

Compute the last three digits of n.