Illinois Institute of Technology
Department of Applied Mathematics and IIT SIAM Student Chapter

**Weekly Problem Competition**

## Friday, October 16, 2009

Assume that $a_1, a_2, \ldots, a_n$ are positive integers ($n \geq 2$), such that $a_1 < a_2 < \ldots < a_n$ and $\sum_{k=1}^{n} \frac{1}{a_k} \leq 1$. Prove that for any real number $x$, the following inequality holds true

$$\left( \sum_{k=1}^{n} \frac{1}{a_k^2 + x^2} \right)^2 \leq \frac{1}{2} \frac{1}{a_1(a_1 - 1) + x^2}.$$

**Remarks:**
The rules and results of the competition can be found at `http://www.math.iit.edu/~weeklyproblem`
You have to submit the solution by email, to `weeklyproblem@math.iit.edu`
Please feel free to tell any IIT undergraduate student about the competition.

# Thank you for your participation
# Good Luck !