1163-15-729 **Raphael Loewy*** (`loewy@technion.ac.il`). *On the spectra of nonnegative symmetric 5 x 5 matrices.*

Given a list $\sigma = (\lambda_1, \lambda_2, \ldots, \lambda_n)$ of complex numbers the Nonnegative Inverse Eigenvalue Problem (NIEP) asks when is σ the spectrum of an nxn nonnegative matrix. When σ consists of real numbers the Symmetric Nonnegative Inverse Eigenvalue Problem (SNIEP) asks when is it the spectrum of an nxn nonnegative, symmetric matrix. Both problems are currently unsolved for $n \geq 5$.

We consider SNIEP in the case $n = 5$. Assume the elements of σ are arranged in decreasing order, and define $s_1(\sigma) = \sum_{i=1}^{5} \lambda_i$ and $s_3(\sigma) = \sum_{i=1}^{5} \lambda_i^3$. The solution is known for $\lambda_3 \leq s_1(\sigma)$. When $y := \lambda_3 - s_1(\sigma) > 0$, we obtain a new inequality involving y, $s_1(\sigma)$ and $s_3(\sigma)$. This enables us to show that certain lists σ, previously unknown to be realizable, are not the spectra of a $5x5$ nonnegative, symmetric matrix. (Received September 12, 2020)