1146-05-299　　　　　　**Grigoriy Blekherman**, **Annie Raymond*** (`raymond@math.umass.edu`), **Mohit Singh** and **Rekha Thomas**. *Simple Graph Density Inequalities with no Sums of Squares Proofs.*

Establishing inequalities among graph densities is a central pursuit in extremal combinatorics. A standard tool to certify the nonnegativity of a graph density expression is to write it as a sum of squares. We identify a simple condition under which a graph density expression cannot be a sum of squares. Using this result, we prove that the Blakley-Roy inequality does not have a sum of squares certificate when the path length is odd. We also show that the same Blakley-Roy inequalities cannot be certified by sums of squares using a multiplier of the form one plus a sum of squares. These results answer two questions raised by Lovász. (Received January 25, 2019)