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Bernard Lidický and **Kyle Murphy*** (kylem2@iastate.edu). *Maximizing 5-cycles in K_4 and K_5 free graphs.*

Using flag algebras, we show that the Turán graph is the unique graph maximizing the number of 5-cycles among all K_4 -free and K_5 -free graphs of order n . This extends the results Bennet, Dudek, Lidický, and Pikhurko, who proved the result for sufficiently large n and K_r -free graphs for all $r \geq 4$. We apply a similar technique developed by Lidický and Pfender to solve the Erdős Pentagon Problem (maximizing the number of five-cycles in a K_3 -free graph) for all n . (Received August 29, 2019)