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### The Multivariate Extension of the von Neumann Inequality

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# THE MULTIVARIATE EXTENSION OF THE VON NEUMANN INEQUALITY

*Anna Gautier*

*Mentor: Greg Knese*

For any one variable function  $f \in \mathbb{C}[n]$ , and a contractive matrix  $T$  ( $\|T\| \leq 1$ ),  $\|f(T)\| \leq \sup_{z \in \mathbb{T}} |f(z)|$ . This inequality, called the von Neumann Inequality, consistently holds true when extended to two variable polynomials, but not when extended to three or more variable polynomials. It becomes interesting to consider the viability of the von Neumann Inequality over subsets of three or more variable functions using certain structures rational functions in three or more variables. By capitalizing on special properties of stable, multi affine, five degree polynomials, there is a necessary condition to determine if a function of that class satisfies the von Neumann Inequality.