

## Victoria Powers

National Science Foundation

will speak on

### Representations of Positive Polynomials: Theory, Practice, and Applications

ABSTRACT: If a real polynomial  $f$  in  $n$  variables can be written as a sum of squares of real polynomials, then clearly  $f$  must take only nonnegative values in  $\mathbb{R}^n$ . This simple but powerful fact and generalizations of it underlie a large body of theoretical and computational results concerning sums of squares and positive polynomials. Suppose  $S$  is a subset of  $\mathbb{R}^n$  and a polynomial  $f \in \mathbb{R}[X] := \mathbb{R}[x_1, \dots, x_n]$  is positive, or nonnegative, on  $S$ . A representation or certificate of positivity for  $f$  on  $S$  is an algebraic expression for  $f$ , usually involving sums of squares of real polynomials, from which one can deduce the positivity condition immediately. For example, writing  $f$  as a sum of squares gives a certificate of positivity for  $f$  on  $\mathbb{R}^n$ .

This talk concerns the theory and practice of representations of polynomials positive on closed subsets of  $\mathbb{R}^n$ , i.e., results about the existence of representations and results about finding and counting representations. We will give some history of the subject, starting with Hilbert's seminal work in the late 19th century, and a glimpse of the many applications.

MONDAY, NOVEMBER 17

LECTURE AT 4:00 PM

COFFEE, TEA, AND REFRESHMENTS FROM 3:40 PM

ROOM 617, WACHMAN HALL

DEPARTMENT OF MATHEMATICS