

**Meeting:** 998, Houston, Texas, SS 19A, Special Session on Algebraic Geometry

998-14-425      **J. Maurice Rojas\*** ([rojas@math.tamu.edu](mailto:rojas@math.tamu.edu)), Department of Mathematics, Texas A&M University, College Station, Texas 77843, and **Casey Stella** ([casey.stella@math.tamu.edu](mailto:casey.stella@math.tamu.edu)), Department of Mathematics, Texas A&M University, College Station, Texas 77843. *A Complexity Threshold for Real Fewnomials*. Preliminary report.

Consider a polynomial  $f$  in  $\mathbb{Z}[x_1, \dots, x_n]$  with exactly  $m$  monomial terms. Let FEWFEAS be the following problem:

Decide whether  $f$  has a real root or not.

Arguably, FEWFEAS is the most fundamental problem of real algebraic geometry. However, other than the fact that FEWFEAS is doable in polynomial time for  $m \leq n + 1$ , little is known about its complexity. So we give a nearly sharp threshold for the set of  $m$  making FEWFEAS NP-hard: We show that for  $m = O(n)$ , FEWFEAS is NP-hard. The best previous bound was  $O(n^4)$ . (Received March 08, 2004)