

INSTITUTE OF MATHEMATICS

**Title of the thesis:** Application of Newton's polytopes to the study of Lojasiewicz's inequalities and some problem of optimization.

**Speciality:** Mathematical Analysis

**Speciality code:** 9 46 01 02

**PhD student:** Dang Van Doat

**Supervisor:** Ass. Prof., Dr. of Sciences Ha Huy Vui

Ass. Prof., Dr. Pham Tien Son

The research was carrying at the Institute of Mathematics, Vietnam Academy of Science and Technology.

Summary: Main results of the thesis are the following

- 1) A new sufficient condition for a non-negative polynomial to be the sum of squares of polynomials is given. This condition is expressed in terms of the Newton polytope of a polynomial;
- 2) We prove that there exists an open and dense semi-algebraic set in the space of all polynomials having the same Newton polytope, such that if  $f$  is a polynomial from this set and if  $f$  is bounded from below, then the problem

$$\text{To find } \inf_{x \in \mathbb{R}^n} f(x)$$

is well – posed;

- 3) A new criterion of the existence of the global Lojasiewicz inequality is given. This criterion provides an algorithm of examining the existence of the global Lojasiewicz inequality of an arbitrary polynomial of two variables;
- 4) The Lojasiewicz exponents are estimated via the degree of a polynomials and other exponents, which are easier computed; the Lojasiewicz exponents of any polynomial of two variables are studied in details and are computed explicitly.

Ass. Prof., Dr. of Science.

PhD student

Ha Huy Vui

Dang Van Doat