ABSTRACTS

Varga Kalantarov

The talk is devoted to the Clay Institute 6'th Millennium Prize Problem on uniqueness and smoothness of solution of the Cauchy problem for Navier-Stokes equations. First, I will introduce the Navier-Stokes equations, explaining the history of these equations. Then I am planning to speak about the main results obtained about existence and uniqueness of solutions of the Cauchy problem and initial boundary problems for Navier-Stokes equations. In the final part of the talk I will discuss the Clay Millennium Prize Problem and some attempts to solve the problem.

Firdevs Ulus

There are different solution concepts for convex vector optimization problems (CVOPs) and a recent one, which is motivated from a set optimization point of view, consists of finitely many efficient solutions that generate polyhedral inner and outer approximations to the Pareto frontier. A CVOP with compact feasible region is known to be 'bounded' and there exists a solution of this sense to it. In order to solve bounded CVOPs, a Benson type algorithm and its dual variant have been proposed recently. These algorithms solve such CVOPs in any dimension, where the objective and constraint functions are not necessarily differentiable and the ordering cones are allowed to be any solid pointed polyhedral cone. In many applications, the feasible region of the CVOP is not necessarily compact and the problem may be unbounded. It is not known if a solution concept which generates polyhedral inner and outer approximations to the Pareto frontier of such problems exists. We show that not all CVOPs are tractable in that sense and give a characterization of tractable problems in terms of the well-known weighted sum scalarization problems.

Burak Kaya

Classification problems have always been a central theme in mathematics. Consequently, one may wonder whether or not it is possible to measure the "difficulty" of a classification problem. Over the last couple decades, descriptive set theory has successfully provided a framework to rigorously measure the relative complexity of classification problems from diverse areas of mathematics. In the first half of this talk, we shall introduce this framework and briefly summarize some key results and their implications. In the second half of this talk, we shall focus on some classification problems from topological dynamics and present some of our own results. No prior knowledge on the topic will be assumed.

Aysel Erey

We consider three polynomials which have been of great interest in graph theory: chromatic polynomial, independence polynomial and characteristic polynomial. The first two of these polynomials arise in a natural and purely combinatorial way; chromatic polynomial counts the number of proper colorings of a graph and independence polynomial is a generating function for the number of independent sets of a graph. Characteristic polynomial has an algebraic flavor; it is a central object of study in spectral graph theory and it is obtained via a matrix associated to a graph. We discuss a number of results on these polynomials including their significant properties, locations of their roots, and how they relate to other polynomials and graph invariants. We also discuss generalizations and variants of these polynomials as well as some extremal problems on the enumeration of related graph parameters.

Özcan Yazıcı

Complex dynamics is the study of iterations of holomorphic functions. In one variable many results were obtained by the tools of complex analysis,

like Montel's theorem. However, in higher dimension, those tools are not available. Later it was realized that complex potential theory can also be used in dynamical studies in one variable. This idea inspired the study of complex dynamics in several variables. In this talk we will first mention some well known results in one variable dynamics. Then we will discuss dynamics of the polynomial automorphisms of C^2, namely, Hénon maps. For these maps, we can construct Fatou sets, Julia sets and invariant probability measures which are analogous to those in the complex plane. If time permits, some recent results on the dynamics in higher dimension will be given.