



Department of Mathematics Special Lecture Series



Alexander Braverman (Brown), Fridays 12-1:30, Math 507, starting 01/23

ALGEBRAIC D-MODULES, part II

The theory of algebraic D-modules, also known as modules over rings of differential operators (whose creation began in the 1970's in the works of J. Bernstein and M. Kashiwara) is essentially a branch of algebraic geometry but it has deep connections with analysis and applications to many other fields of mathematics (such as, for example, representation theory).

The purpose of the course is to give an overview of this theory starting with some very elementary questions and gradually building up an advanced theory. Specific topics (time permitting) may include:

- 1) The Weyl algebra and modules over it, Bernstein's inequality, holonomic modules, applications to analytic continuations of distributions with respect to a parameter.
- 2) D-modules on affine varieties, direct and inverse images.
- 3) Derived categories.
- 4) D-modules on general varieties.
- 5) Holonomic D-modules with regular singularities
- 6) Riemann-Hilbert correspondence and perverse sheaves.

In terms of prior knowledge, in the first half of the course just basic undergraduate algebra will be needed (knowledge of basic homological algebra will be helpful but not strictly necessary). In the second half we are going to use some basic algebraic geometry (schemes, quasi-coherent sheaves and their cohomology, Serre duality etc.).