# Spring 2013, Course 18.737, Introduction to algebraic groups

## MW 2:30–4, Room 2-135

**Instructor:** Roman Bezrukavnikov, office 2-284.
e-mail: bezrukav  math.mit.edu

Groups arise in describing symmetries of a mathematical object. Depending on the nature of the object, the group may carry additional structure. In particular, a group which also has a compatible structure of an *algebraic variety* is called an algebraic group. In other words, algebraic groups are groups in the context of algebraic geometry.

The course will cover the theory up to classification of semi-simple (or reductive) algebraic groups over an algebraically closed field in terms of root data.

Time permitting, we will move into invariant theory which studies the procedure of taking quotient of an algebraic variety by the action of an algebraic group.

Basic algebraic geometry used in the course will be described in the beginning.

**Prerequisites.** Basic group theory. Some experience with algebraic geometry or commutative algebra would be helpful.

**Textbook.** I will mostly follow Springer's book "Algebraic groups" covering chapters 2–10. There are several other textbooks including: Borel, "Linear algebraic groups"; Humphreys, same title and the 3 volume treatise "Schémas en groupe" by Demazure, Grothendieck et al.

**Homework** There will be weekly homework assignments due on Friday by 3pm. You can bring it to my office or e-mail me the solution in any reasonable electronic format (including a scan of your handwritten paper).

**Course materials** including homeworks will be posted at:
http : //math.mit.edu/ ∼ bezrukav/18_737.html
**Office hours.** M 3-4; you are also welcome to stop by my office any time, send me an e-mail in advance if you want to make sure I am available.