Spring 2003 Math 991A, Topics in Algebra:  
Introduction to Algebraic Groups  
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In this course I will give an introduction to the theory of algebraic groups.  
(1) We will introduce basic algebraic varieties used in for algebraic groups and projective spaces.  
(2) Algebraic groups and their actions on algebraic varieties and rational representations.  
(3) Lie algebras of algebraic groups, Differentials and separability theories and smooth points.  
(4) Properties of morphisms, finite morphisms, dominant morphisms, smooth morphisms, and proper morphisms etc.  
(5) Construction of quotient varieties, homogeneous spaces and quotient groups.  
(6). Structure of solvable algebraic groups and unipotent groups.  
(7) Complete varieties, parabolic subgroups and Borel subgroups.  
(8) Torus action on projective varieties.  
(9) Roots and Weyl groups, Structure of reductive algebraic groups.  
I will more or less follow Springer's book on Linear Algebraic Groups. (the enlarged edition. This is only a semester long course and aimed to give an introduction of the area. The intended materials to be covered will require two-three semesters. Serious students should plan to fill in all the details at least for the first half of the semester and with additional reading in the subject. Many of the proofs will be omitted. Students need to have a good master of basic commutative algebra knowledge such as integral domains, prime ideals and maximal ideals in a commutative algebra.