Math 622: Algebraic Geometry **Spring 1994**

Syllabus

Jan. 12	**1. Lie Groups** *a*) Definitions, examples, semidirect product, Aut X
14	1.*b*) Lie algebras, exp
17	1.*b*) Lie algebras
19	1.*c*) Levi-Malcev decomposition, $G = R \times S$
21	1.*d*) Root decomposition of semisimple
24	1.*d*) Classification of semisimple
26	1.*d*) Standard bases
28	1.*d*) Computing roots from Cartan matrix
31	**2. Homogeneous Spaces** *a*) Definitions, groups actions, cosets, manifold structure, fibrations
Feb. 2	2.*a*) Examples $\mathbf{P}^n$, $\mathrm{Gr}(k,n)$, Q^n, Iwasawa, $\mathbf{C}^n$, $\mathbf{C}^n \setminus 0$, $\mathbf{B}^n$, Δ^n
4	2.*b*) Parallelizable manifolds, Wang's Theorem
7	2.*c*) Equivariantly imbedded, clsd, homogeneous, in $\mathbf{P}^n$
9	2.*c*) B-fixed point, classification of parabolic
11	2.*d*) Standard fibrations: Normalizer, Albanese, radical
14	2.*d*) Borel-Remmert
16	2.*d*) Reductions: holomorphic, meromorphic, hyperplane,...
18	2.*e*) Non-compact homogeneous, affine/Stein, Matsushima
21	2.*e*) Generalizations, extensions of representations
23	2.*e*) Winkelmann's example
25	2.*e*) Quasi-affine, observable subgroups
28	**3. Homogeneous Bundles, I** *a*) Definitions, examples, coset maps, vector bundles, T_X, $\bigwedge^p T_X^*$
Mar. 2	3.*b*) Line bundles, homogeneous (proof), K_X, characters
4	*Extra*
5–13	**Midsemester Break**
14	**4. Elements of Representation Theory** *a*) weights, standard bases, roots
16	4.*b*) Weyl group, chambers, length, singular
18	4.*b*) How to compute orbits, examples
21	4.*c*) How to calculate weights of a representation
23	4.*d*) Formulas: Weyl character and dimension, examples
25	4.*d*) Freudenthal's formula, examples
28	4.*e*) Computer implementations
30	*Extra*
Apr. 1	*Easter Break*
4	*Easter Break Quiz 9*
6	**5. Homogeneous Bundles, II** *a*) Borel-Weil (proof)
8	5.*b*) Bott's Theorem (proof)
11	5.*b*) Applications, $\mathbf{P}^n$, rigidity
13	5.*c*) Dolbeault Cohomology, hermitian symmetric spaces
15	5.*c*) General, filtrations
18	5.*c*) Computer algorithms, examples
20	5.*d*) Nef value, how to compute K_X^*
22	5.*d*) Related vanishing theorems
25	5.*d*) Classification of positive defect
27	*Extra*
29	*Study Day*