MATH 155: SUGGESTIONS FOR FINAL PROJECTS

(1) Some basics about Coxeter groups, such as notion of length, Bruhat order, or some classification results. Reference: Humphreys book "Reflection groups and Coxeter groups".

(2) Probabilistic proof of the number of Young tableaux of a given shape. Reference: old edition of Bruce Sagan's book *The symmetric group: representations, combinatorial algorithms, and symmetric functions.* For an alternative proof, see the new edition.

(3) Chromatic symmetric functions. Reference: The paper "A symmetric function generalization of the chromatic polynomial of a graph" by Richard Stanley, *Advances in Math* 111 (1995), 166–194. (The sequel to this paper "Graph colorings and related symmetric functions: ideas and applications" is on Stanley's webpage.)

(4) The Grassmannian and its cell decomposition into Schubert cells indexed by partitions (and maybe some other stuff like cohomology). Reference: Manivel's book "Symmetric functions, Schubert polynomials, and degeneracy loci", or perhaps Fulton's book.

(5) Matroids and the matroid stratification of the Grassmannian. Reference: paper of Gelfand, Goresky, MacPherson, Serganova "Combinatorial geometries, convex polyhedra, and Schubert cells," Adv. Math. 63 (1987) 301–316.

(6) The permutohedron and the associahedron (perhaps more generally, graph-associahedra). Reference: Ziegler's "Lectures on Polytopes," or the book "Oriented Matroids" by Bjorner, Las Vergnas, Sturmfels et al, or the paper by Carr and Devadoss: http://front.math.ucdavis.edu/0407.5229

(7) Proof of the Littlewood-Richardson rule (which explains how to multiply Schur functions together). Reference: Stanley's book "Enumerative Combinatorics 2."

(8) Fomin's growth diagrams for RSK. Reference: Stanley's book–above.

(9) Plane partitions and alternating sign matrices. one possible reference is: http://front.math.ucdavis.edu/0008.5045

(10) Something of your own choosing. (But talk to me about it in advance.)