MATH 206B – COMBINATORIAL THEORY: TOTAL POSITIVITY

Course description: We will discuss combinatorial aspects of recent developments in the theory of total positivity. We will also consider several applications to particle physics and statistical mechanics. The following topics will be covered:

- Grassmannians and flag varieties.
- Permutations, reduced words, matroids, and planar bipartite graphs.
- Polytopes: permutohedra, associahedra, hypersimplices, cyclic polytopes, zonotopes.
- Combinatorial topology: partially ordered sets and regular CW complexes.
- Amplituhedron and the physics of scattering amplitudes.
- Statistical mechanics: electrical networks and the Ising model.

Instructor: Pavel Galashin (galashin@math.ucla.edu)

Time and location: MWF 1-1:50, room MS 5127.

Grading: based on several homework problem sets.

Prerequisites: basic knowledge of linear algebra.

Office hours: by appointment.

Course webpage: http://math.ucla.edu/~galashin/206B.html

Date: Winter 2020.