PREREQUISITES TO TOTAL POSITIVITY

The key material is mostly self-contained. But familiarity with (not deep knowledge of) the following topics would be helfpul.

Topics from linear algebra, used in proofs of some key statements.

- The Perron-Frobenius Theorem
- The Cauchy-Binet Formula
- Lindström-Gessel-Viennot Lemma
- (Not very important) Familiarity with *exterior algebra* (wedge product).

Lie theory plays a motivating role in both total positivity and cluster algebras. I will make passing references to these concepts.

- Definition of Lie groups, familiarity with the importance of *semisimple* (or *reductive*) Lie groups (as building blocks of all other Lie groups).
- *Cartan-Killing classification* of semisimple Lie groups by *Dynkin diagrams* (A,B,C,D,E_6,E_7,E_8).
- Notions of *root system* and *Cartan matrix*.
- (Not as important) Concepts like Borel subgroup, maximal unipotent subgroup, and flag variety. Natural concepts in Lie theory should be expressible in terms of these sorts of objects.

Baby algebraic geometry, which is useful language in total positivity and cluster algebras.

- Definition of *affine algebraic variety* (solution set in $\mathbb{C}^n$ to a system of polynomial equations). Concept of *coordinate ring* of an affine algebraic variety. Concept of *field of rational functions* of an affine algebraic variety. Perhaps, definition of a *(complex) algebraic torus*.
- Fact that the category of affine algebraic varieties is "the same as" (equivalent to) the category of finitely generated k-algebras.

From topology:

- The classification of surfaces (we will only need orientable surfaces), and the concept of *surface with boundary*. Familiarity with definition of mapping class group would be great (but is not assumed).
- (Not very important) Concept of a simplicial complex.
- (Not very important) Concept of CW complex.