

Math3250 Combinatorics Reading HW 18

Instruction. Submit your homework by email (subject: Math3250 Combinatorics Reading HW 18). Use a scanner app to convert to PDF your hand-written work.

References:

- J. Scott, *Grassmannians and Cluster Algebras*
- A. Postnikov, *Total Positivity, Grassmannians, and Networks*

VIDEO/LECTURE NOTES

Either watch the lecture video of plabic graphs Part 2 (16 minutes) on YouTube. The lecture notes are in [lecture notes for plabic graphs part 2](#). It might be faster to watch the video.

Write down what you did. The video is at original speed — you can play the video at faster speed if you are not taking notes.

EXERCISES

Do **four** or more of the following exercises

- (4) Attempt HW4' in the new lecture notes.

A triangulation T_2 of an n -gon is placed “higher” than T_1 if T_2 is the result of removing a diagonal from T_1 and replacing it with another diagonal of higher slope. This rule works for all n and forms a nice partial order which shows up in many areas of mathematics outside of combinatorics.

Look at the five plabic graphs from Example 3 (from the previous Reading Homework). Can you come up with a rule that tell you when a plabic graph from Example 3 should be placed “higher” than another plabic graph? One rule is to simply look at the corresponding triangulation, but try to find a rule that does not rely on triangulations.

- (5) Compute the trip permutation of the plabic graph D_1 . How is this trip permutation similar to the trip permutation of G_1 – G_5 ?

The picture of D_1 and partial solution are on p. 6 of note.

- (6) Compute the (source) face labeling of D_1 .

The picture of D_1 and partial solution are on p. 5 of note.

- What is special about the label of each external face?
- What is special about the label of each internal face?

- (7) Compute the face labeling of D'_2 and compare with the face labeling of D_1 . What changes and what stays the same?

The picture of D'_2 is on p. 6 of note.

- (8) Follow the steps of applying $(M2')$ and then the square move (as given in question 7 above) to D_1 , but for a different square. See picture of D_1 on p. 7 of note.

- (9) Compute the trip permutation of the plabic graph E_1 .

How is this trip permutation similar to the trip permutation of D_1 and the trip permutation of G_1 – G_5 ?

Picture of E_1 and partial solution are on p. 7 of note.

- (10) Compute the (source) face labeling of E_1 . Hint: each face is labeled by three numbers.

Picture of E_1 and partial solution are on p. 7 of note.

- What is special about the label of each external face?
- What is special about the label of each internal face?

LAST SECTION

- Email me with a couple of the above exercises that you would like to show during class on Thurs Apr 30.
- Questions, comments, suggestions?