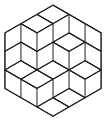
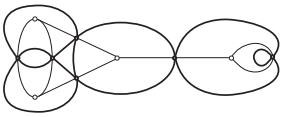
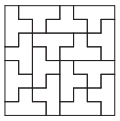
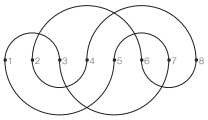
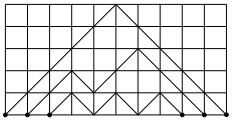

algebraic combinatorics

san francisco state university federico ardila m.

The topic. Enumerative combinatorics is about counting. The typical question is to find the number of objects with a given set of properties.
However, enumerative combinatorics is not just about counting. In "real life", when we talk about counting, we imagine lining up a set of objects and counting them off: $1, 2, 3, \ldots$. However, families of combinatorial objects do not come to us in a natural linear order. To give a very simple example: we do not count the squares in an $m \times n$ rectangular grid linearly. Instead, we use the rectangular structure to understand that the number of squares is $m \cdot n$. Similarly, to count a more complicated combinatorial set, we usually spend most of our efforts understanding the underlying structure of the individual objects, or of the set itself.
Many combinatorial objects of interest have a rich and interesting algebraic structure, which often becomes a very powerful tool towards their enumeration. In fact, there are many families of objects which we only know how to count using these tools. Our goal in this course is to highlight some key aspects of the rich interplay between algebra and enumerative combinatorics.

Instructor. Federico Ardila . `federico@sfsu.edu` . Thornton 927 . 1.415.338.7720

Homework. During the first half of the course, biweekly, you will have assignments ranging from fairly routine exercises to challenging problems. Working in groups will be encouraged. During the second half of the course, weekly, you will be assigned a short exercise designed to verify basic proficiency with the material.

Project. In the second half of the course, in pairs, you will write a final project. This will be a chance to go much deeper into a topic of your choice. This could be an expository paper summarizing an aspect of algebraic combinatorics that interests you, the beginning of an original research project, or (why not?) the solution to an open problem in the field. This may be a good opportunity to find a thesis topic. I will suggest possible projects.

Textbook. There is no required textbook. Parts of the course will follow parts of:
- F. Ardila, *Algebraic and geometric methods in enumerative combinatorics.*
- R. Stanley, *Topics in algebraic combinatorics.*
- H. Wilf, *generatingfunctionology.*

Course website. `http://math.sfsu.edu/federico/algcomb.html`

Meetings. Tuesdays and Thursdays 2:10-3:35. Thornton 211.

Office hours. To be determined.

Prerequisites. You must be prepared to devote at least 10 hours a week on this class, and be very comfortable with:
- Math 325 and Math 335 (SFSU) or equivalent.

Grading and tentative due dates. Your grade will be based on:
- 40% main homework
- 10% light homework
- 10% project proposal (due Nov 4 in LaTeX)
- 50% final project (due Dec 16 in LaTeX) (I know...)
- numerous opportunities of extra credit.