

Math 101 Finite Mathematics
Group Project

You will work in groups of three to five people to turn in a project, consisting of a paper and an in-class presentation (as well as a peer evaluation of the work of the members of your group), on a topic from the first half of the class. The paper is due in class on **Monday, April 11** ; the presentations will be **Monday, April 4, through Friday, April 8**. The list of possible topics is given below.

By **4:00 pm Monday, March 21**, send me an email with the following information.

- (1) The names of the three to five people in your group.
- (2) A ranking of the projects, from favorite (first) to least favorite (last). I will assign you a project based on the rankings.

The presentation: Each presentation should last 15 minutes. All group members are responsible for presenting. Your presentation can be as high- or low-tech as you'd like. Feel free to use the chalkboard, the overhead projector, the internet, Powerpoint, physical demonstrations, etc. You have a lot of freedom. Be sure to practice before you give your talk; you may find it more difficult than you expect!

Your presentation will be graded on the following criteria:

- (1) *Overview:* What is the context of the problem? Was the background of the topic explained? What assumptions are you making?
- (2) *Mathematics:* How is mathematics used in your project? Have you clearly explained how the ideas of this course are used? Since you only have 15 minutes you do not have time to do every detail, but you should at least outline the development of the necessary mathematical theory.
- (3) *Clarity:* Is all new terminology and notation defined? Do you make your points clearly?
- (4) *Style and organization:* Is the talk polished? Does it look like you have practiced it? Is the talk well organized and well planned? Did all group members participate in the presentation?

Hint #1: It's a very good idea to visit the Speaking Center while you're planning your presentation.

Hint #2: One of the most common mistakes that students make in presentations is rushing through the introduction. Make sure to spend plenty of time setting up the problem. Remember, the audience won't care about the answers you're giving if they don't understand the questions.

The paper: There is no page limit (maximum or minimum) for your write-up. You are required to use at least two outside sources. (Websites and your textbook don't count toward this minimum, although I encourage you to use them.) It should be typed. For many of you the write-up will include more information than you will be able to present (those 15 minutes will fly by!). The paper should be written in complete sentences, with correct grammar and punctuation. It should read like a research paper, not like a homework assignment. You are free to use any word processing software that you like, but Microsoft Word has an equation editor that may help with the writing. *It's a good idea to visit the Writing Center while you're working on your paper.* Lastly, it is very important to cite any outside sources and to include a bibliography. Be aware of Agnes Scott's strict policy on plagiarism!

Your paper will be graded on the following criteria:

- (1) Do you address all of the issues in the assignment?
- (2) Can the paper stand on its own? That is, can the paper be understood by someone who didn't see the presentation?

- (3) Is the paper well written (including punctuation and grammar)?
- (4) Did you use at least two outside sources? (Remember, your textbook and websites don't count toward this minimum.) Are all outside sources cited appropriately? Is there a bibliography?

Timeline:

- (1) Monday, March 21 - submit project requests by 4:00
- (2) Monday, April 4, through Friday, April 8 - project presentations in class
- (3) Monday, April 11 - papers and peer evaluations (forms available on the Assignments webpage) due in class

List of projects:

- A. Envy-free fair division:** This is project 3.A on p. 132 of the textbook.
- B. Apportionment methods and the 2000 presidential election:** This is project 4.B on p. 169 of the textbook.
- C. Apportionment: Congress and the Supreme Court:** This is project 4.D on p. 170 of the textbook.
- D. Penrose tilings of the plane:** This is project 11.C on p. 471 of the textbook.
- E. Symmetry and beauty:** This is project 11.D on p. 471 of the textbook.
- F. Symmetry types of plants and animals:** Most living things exhibit symmetry. Discuss the different kinds of symmetry found in plants and animals, and explain what biological purposes the symmetries serve. *Why* is it symmetric?
- G. Fractal dimension:** This is project 12.A on p. 511 of the textbook.
- H. Fractals in the human body:** Many parts of the human body display fractal properties: blood vessels, the lungs, the brain, nerve endings, and others. Discuss some examples, and explain what biological purposes the fractal structures serve. *Why* is it a fractal?
- I. Iterated function systems:** The recursive procedures given in the textbook for generating the Koch snowflake and the Sierpinski gasket are examples of iterated function systems (IFS's). Visit Dr. Riddle's IFS page (<http://ecademy.agnesscott.edu/~lriddle/ifs>) and explain the rules that generate some of the fractals shown there. Then use his Windows program IFS Construction Kit (<http://ecademy.agnesscott.edu/~lriddle/ifskit/>) to create IFS that generate fractals in the shape of your initials (one for each member of the group). (See <http://aaa.lids.mit.edu/fractal-initials> for an example.)
- J. Fractals in painting and poetry:** Some critics have argued that fractal patterns appear in painting and poetry, and that these patterns are pleasing to the human mind. Discuss this argument and give some examples. You may want to analyze fractal patterns in other works yourself, or even create your own works that include fractals.

Some suggested reading:

- Taylor, R.P., A.P. Micolich, and D. Jones. "Fractal analysis of Pollock's drip paintings." *Nature* 399 (1999), p. 422.
- Pollard-Gott, Lucy. "Fractal repetition structure in the poetry of Wallace Stevens." *Language and Style* 19:3 (1986), pp. 233–249.