

# Mathematics 112L: Research Faculty Interaction (Lab)

for Math 112L sections 01, 02, and 03 (Jack Bookman and Victoria Akin)

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Spring 2020

Thursdays 11:45 am – 1:00 pm

Gross Hall 103

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Professor: Lenny Ng

My e-mail: ng@math.duke.edu

My office: Physics 216

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**Please read this syllabus carefully, as you will be responsible for knowing course policies as laid out in this document.**

**Synopsis:** We will explore a variety of topics in mathematics, with an emphasis on the creative process of discovering and analyzing patterns. We'll see how the golden ratio and the Fibonacci numbers appear in unexpected ways in nature; the mathematical reason why chromatic scales in music have 12 tones; how a brain teaser called the Monty Hall problem stumped many math professors but not a group of pigeons; and many other nontechnical ways that mathematical reasoning can appear in everyday life. We'll also plan to explore some "recreational" aspects of math, possibly including: how the ancient Greeks found order and symmetry in three-dimensional shapes; how to connect houses to utilities by pipes that don't cross, and what this has to do with Möbius strips and other geometric surfaces; a baby version of calculus called the calculus of finite differences, and what it has to do with slicing pancakes into pieces; and logic puzzles including the unexpected hanging and the blue-eyed islanders. The overarching theme of all of these topics is that they give different glimpses into how mathematicians think and hopefully show how fun it can be to think this way. Some of the topics may be related to calculus, but many will not, and they should be accessible regardless of how well you remember high school mathematics.

**Note on content:** The RFI component of Math 112L is functionally independent from the main part of the course, and we do not expect that there will be much overlap in topics. It may be helpful to think of the RFI as allowing you to explore a different perspective on the study of mathematics that complements what you see in calculus.

**Meetings:** Our Research Faculty Interaction (RFI) will meet each Thursday during the semester, **except** for the Thursday classes that are devoted to midterms: **February 20, March 26, and April 16.**

*(There is a second page.)*

**Quizzes:** The first 10 minutes of each Thursday class will be occupied by a quiz, except for the first meeting (January 9) as well as the three midterm dates. Each quiz will be closed-book and closed-notes, and will feature short questions related to the material we explored in the previous Thursday's class. *Please arrive on time* to give yourself enough time to complete the quiz. Quizzes must be taken during the allotted time; *there are no makeups*. (See also the policy on excused absences below.) Your lowest quiz score will be dropped.

**Grading:** The RFI component of this course constitutes 15% of your overall grade for Math 112L. Your grade for this component is determined entirely by your quiz scores, with the lowest score dropped.

**My office hours:**

- Mondays 2:00–3:00 pm
- Thursdays 9:45–11:00 am

or by appointment (please email me). These are in my office, Physics 216. Please take advantage of office hours if you have questions about RFI course material. Please note that my official office hours are shared with my other class (Math 411) and I expect students from that class to attend especially the Monday hour.

**Sakai:** I will use Sakai to post information related to our RFI. This includes a rough schedule of class topics, to be updated as we go through the semester. (See under "Syllabus" on Sakai.) After each Thursday class, I will also post a couple of problems related to that day's material. *These are not to be turned in*; they are there for you to review your mastery of the topic and prepare for the next week's quiz. (See under "Announcements" on Sakai.)

**Missed work:** Per university policy, missed course work is officially accommodated only in certain specific circumstances, including short-term illness. See <http://trinity.duke.edu/undergraduate/academic-policies/class-attendance-and-missed-work> for the official policy, including the procedures you must follow for the missed work to be excused. For Thursday RFI meetings of Math 112L, all incapacitation forms and requests for excused absences for RFI meetings should be sent to me (Lenny Ng) rather than to your regular instructor.

If you are excused from an RFI class that contains a quiz, then that quiz does not count toward your quiz average (nor does it count as your dropped lowest score). If you do not take a quiz and your absence is *not* excused, then you will receive a 0 grade for that quiz.

**In-class behavior:** Please remember that you are sharing the classroom with other students, and avoid behavior that could be distracting to others. I am allowing laptop use for the specific purpose of taking notes only, but I may revisit this policy if it proves too distracting to the class as a whole.