18.900, GEOMETRY AND TOPOLOGY IN THE PLANE: WHAT IS THIS COURSE ABOUT?

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The aim of 18.900 is to introduce you to geometric and topological thinking in the widest sense. To make use of our geometric intuition, we will stay in the two-dimensional plane (mostly). I hope that this is useful not just for those already interested in geometry and topology, but also for anyone who may encounter it in other contexts.

How will Covid19 affect the Fall 2020 edition of the class? It will cause the lecturer to crouch miserably under his blanket. Actually, we will teaching it in an active learning style: fingers crossed.

I only have 18.01 and 18.02 as background. Can I still take the class? No-ish. For parts of the class, this is fine, but on occasion we will use more complex numbers, and more linear algebra, than you’ve seen. Also, I tend to take a level of mathematical comfort for granted, which means I may skip steps instead of laying breadcrumb trails. So, I stand by the official requirements of GIRs plus 18.03 or 18.06. That being said, if you’ve been successful with 18.022, you’re presumably ok.

Is this only for math majors? As long as you’re open-minded and enjoy fiddling with a bit of math, you’re in. A lot of the advice I give below is formulated in 18.xyz terms, but that’s just because I happen to know that corner of MIT best.

Is this an easy or low-workload class? Ehm. The level of abstraction is low (ludicrously low if you compare it with 18.901, but about the same as 18.950, except 18.950 has longer formulae). We won’t have the same one-block-on-top-of-the-other theory-building that many pure math classes have. However, the class moves fast: just when think you’ve mastered one topic, we’ll turn to a completely different one. So, even though most single ideas are not very difficult in themselves, you need to maintain a high absorption rate.

Is there a textbook or lecture notes? No textbook, due to the unique nature of the class. There are extensive lecture notes and I will post them. I will also frequently revise them. Moreover, there will be videos of lectures.

Will 18.900 prepare me for taking 18.xyz? The motto here is instant gratification.

I am definitely not teaching this to “lead up” to something specific. Of course, a whole number of things hopefully make more sense to you after taking this (18.901, 18.904, 18.950, 18.905, computational geometry classes, . . . ).

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Is this a Euclidean Geometry class? Not in the sense of Classical Geometry. We’ll have areas, distances, angles, and polygons; but we won’t obsess about special points in triangles. If you’re into Classical Geometry, that’s cool and there are great books available; but I suck at it.


Will this class teach me how to write proofs? Do I need to already know how to write proofs? No and no. We skip a lot of the abstract setup, and try to develop your intuition instead, so no definitions of the bloody obvious.

That being said, the class does represent a step away from the computational focus of the GIRs, towards a more conceptual discussion. But it’s not a completely formalized discussion.

I am primarily interested in geometry because of General Relativity. Will this class help? No. If that’s where you want to go, it’s probably better to head to 18.950, then to 18.101, and then to graduate differential geometry (18.965).

Are you an expert in all this? Oops. A lot of the material is stuff I learned myself for this class. I’m sure you’ll have plenty of opportunities to correct me.

You seem to have a propensity to answer questions in the negative. Is there anything actually good about this class? It shows you a lot of different ideas. The mathematical theory of billiards (particles bouncing of walls, or light reflected) gives you a peek into dynamical systems. Polygons, polygonal curves and complexes are your introduction to combinatorial/computational geometry. Winding numbers, homotopy classes, and Betti numbers are bits of algebraic topology. Immersed curves are part of geometric topology. There will be enough differential geometry to show you some basic ideas. And, real algebraic curves can be considered as the only piece of algebraic geometry where you can actually draw stuff.

Is it going to be fun? If it’s not, why are we doing it? The selection of topics is guided by yumminess instead of it’s-oh-so-central-to-mathematics.

At the end, what will I have gotten from the class? In the best case, your mathematical intestinal flora will have been revamped, changing the way in which you digest geometric and topological thinking.