

# Math 321: College Geometry

Spring 2015

3 credits

Instructor: Dr. Dibbs

**Instructor:** Rebecca Dibbs, PhD

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**Office:** 303 Binnion

**Office Hours:** M 2-3 & 6:20-7:20; T 10-11; W 2-3; R 10-11

**Class Meets:** TR 8-9:15

**Texts:** The readings for this course will come from photocopied handouts. They will come mainly from *Experiencing Geometry In Euclidean, Spherical, and Hyperbolic Spaces* by David W. Henderson and from Euclid's *Elements*.

**Course Materials:** You will need a folder or binder in which to keep your written work and a flash drive on which to keep your work done on the computers. You will also want to have a sphere of some kind to look at when we study spherical geometry. Tennis balls work well, as do the plastic spheres often available at craft shops.

**Course Description:** This course is about geometry, but it is also a course about learning to develop and express your own mathematical ideas. It will emphasize ideas and imagination in addition to techniques and calculations. We will be investigating not only the planar Euclidean geometry that you probably studied in high school, but also geometry on spheres, cylinders, cones, pool tables, and other surfaces. We will try to imagine what geometry would be like for someone living on each of these surfaces. We will be studying these geometries not only because they are useful and can tell us surprising things about the world in which we live, but also because they are beautiful and fascinating subjects.

This course may be very different from most other math courses that you have taken. High school and introductory college math courses usually focus on teaching methods of doing computations: mathematics as finding the correct answer. In this course, we are going to focus on another kind of mathematics: mathematics as a way of thinking about and trying to understand the world. We'll try to understand how people decide what is true, and how they reason about mathematics and geometry in particular. We are going to focus on the process as much as the results of mathematical thought.

Writing is an important part of this process. Contrary to what some other math courses may have led you to believe, it is virtually impossible to do mathematics without writing about it. Writing is a tool for communicating ideas to other people, but it can also be used as a tool for clarifying one's own ideas. It can be very hard to spot a flaw in a line of reasoning if you haven't written it down; conversely, writing down a line of reasoning is often the best way to expose any problems that it might have. For these reasons, practicing mathematicians invariably use writing as a vital part of their work, and writing will be an integral part of this course.

This course will require a willingness to invest significant amounts of effort grappling with developing your own ideas. In this course, as in the real world, you will be the ultimate arbiter of what you believe to be true. Deciding for yourself what is true is not easy, but it can be very rewarding.

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**Writing Assignments:** Over the course of the semester, I will be assigning a series of problems for you to write about. Some of these will be informal writing assignments that will be graded only on how complete they are; others will be formal writing assignments, for which you will be expected to turn in a typewritten paper that will be graded not only on the completeness and correctness of your answer, but also on the clarity of your explanations. All of these problems will go through a process of revision: I will make comments on them, and then you will have an opportunity to revise them. You should explore each question and write out your thinking in a way that can be shared with others. Focus on your own ideas and understandings, and turn in whatever your thinking is on a question, even if only to say, "I do not understand such and such" or "I am stuck here." Be as specific as possible. Conjecture. Use pictures. Respond to my comments and questions. Only the final draft of the formal writing assignments will be graded. There will also be at least one major group project assigned during the semester that will make up a significant part of your final grade. There will also be a take home midterm and a final project that will be presented during our scheduled *final exam meeting time, which is at*

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At the end of the semester, I will ask you to turn in your portfolio containing all the work that you have done for this class, including all drafts of all papers, so please save everything. On average, you should expect to spend at least nine hours per week outside of class on this course. If you are concerned about the time that you are spending on this class, come see me.

**Grades:** Your final grade will be computed from your final formal and informal assignment averages. The informal assignment average will be weighted to be 40% of your final grade, and the formal average will be 60% of your final grade. Letter grades will be given following a traditional grade breakdown.

**Due dates:** All assignments will have assigned initial due dates. Revisions of formal writing assignments will be due sixteen days after the previous draft, and only the final draft will be graded. Informal assignments can be revised as many times as you like; however, they should be substantially done within sixteen days of the original due date. Progress made after this date will count half as much as progress made before this date, unless the problem is at least 3/4 complete by then.

**Hints for Success:** The best approach is to strive for a solid understanding of the course topics and to accept at the start that this necessarily entails some struggling with ideas and feelings of frustration. The course problems take time, especially time to explore and think about the ideas. Often you will need to walk away for a while or for a day, and return to a problem for a second or third look before writing up your response. Expect this. However, do not get behind on the problems. Try to cultivate an approach that is a nice balance between "just getting it done" and avoiding it altogether. Stay connected, and come see me if you are having difficulties.

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**Group Work:** We will often work in groups in this course. Whenever a group hands in a written assignment, they are required to put on the paper the names of those who participated fully, and only those names. Each person must sign the final copy. Your signature certifies that you participated equally in the project. It is dishonest to turn in work that is not solely and equitably the creation of the team members. You are not required to include on the report the name of someone who started but did not finish, or who did not contribute their share. Also, as the instructor I reserve the right to assign group members different grades if it doesn't appear that every contributed equally.

**Outside Sources:** A central aim of this course is to help you learn to develop your own ideas about mathematical questions. You therefore should **NEVER** consult any reference materials outside of the course texts in answering questions for this course. This includes materials found on the internet. *The ideas that you present should be your own.*

**Office Hours:** My office hours are listed above, and will be held in 303 Binnion Hall. Please come see me! The best way to make an appointment or to get in touch with me for any other reason is to send me an email.

**Attendance:** It is absolutely vital for an interactive class like this that you come to class and participate. Your attendance will count as part of your class participation grade, and excessive late arrivals will count as an absence.

**Licensure:** This course provides content necessary to enable secondary licensure standards to address the K-12 Texas TKEs.

**Disability Support Services:** The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

## Office of Student Disability Resources and Services

Texas A&M University-Commerce

Gee Library- Room 132

Phone (903) 886-5150 or (903) 886-5835

Fax (903) 468-8148

[StudentDisabilityServices@tamuc.edu](mailto:StudentDisabilityServices@tamuc.edu)

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## Tentative Due Dates

All dates are subject to change!

Assignment	Tentatively Due	First Due	Second Due **
Email introduction	1/22		N/A
Reading: Henderson, Introduction, Problems 1 and 2	1/29		N/A
I1: Tubes	1/29		
Reading: Euclid: Definitions, Postulates, Common Notions, and Proposition 1	2/3		N/A
F1: Straightness on the Sphere	2/5		
I2: Computer Lab 1	2/17		
I3: Euclid's Postulates on the Sphere	2/19		
Reading: Euclid: Propositions 4 and 5	2/26		N/A
I4: Make a Hyperbolic Plane!	3/5		
I6: Worksheets	3/10		
I6: Euclid's Postulates on the hyperbolic plane	3/24		
F3: Side-Angle-Side on the Sphere	3/26		
Midterm Given Out	4/2		-----
I7: Henderson 7.1	4/7		
Midterm Due	4/9		
I8: TKEs	4/21		
I9: Folding a Parallel Line	4/23		
F5: Cone Project Drafts Due (Optional)	5/5		N/A
I8: The Shape of Space	5/12		5/12
Final Projects and Portfolios due	5/12	5/12	5/12

\*\*Informal assignments need  $\frac{3}{4}$  of a circle when submitted by the second due date in order to be able to get full credit!

Also, formal assignments are assigned a final grade by the second due date and cannot be resubmitted.