Syllabus for Math 475, *Fundamentals of Geometry*, Fall 2017

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COURSE DESCRIPTION: This course will cover topics from Euclidean and non-Euclidean Geometry. We will use the software Geometry Explorer as a supplement to the text. It is understood that the students have as a pre-requisite an understanding of (high school level) Euclidean geometry as well as prior experience with proving mathematical results at the level of Math 245. Topics for this course will include axiomatic geometry, more Euclidean geometry, analytic geometry, transformational geometry, non-Euclidean geometry and fractal geometry. We will cover most of Chapters 1, 2, 5, 7-10 of the text.

TEXT: *Exploring Geometry Second Edition* by Michael Hvidsten. The software Geometry Explorer can be downloaded here: http://homepages.gac.edu/ hvidsten/gex/download-2.0.2.html. There is a student solution manual available with answers to odd problems here: http://homepages.gac.edu/ hvidsten/geom-text/student-guide-ed2.pdf. (you're welcome)

LaTeX: In this class, we will use the mathematical typesetting program LaTeX. LaTeXis the standard typesetting tool of mathematicians all over the world. Whether you will be teaching, working in business or in academia, LaTeXis useful for preparing mathematical documents. See my website for information on installing and running LaTeX. A useful text for learning and using LaTeXis *LaTeX: A Document Preparation System* by Leslie Lamport.

CLASS STRUCTURE: It is extremely beneficial to read the section that we will cover BEFORE class. Classes will be in lecture format. I will try to answer homework questions at the beginning of each class. Try to have at least attempted the homework problems before class. There is a big difference between understanding the problem after attempting the problem yourself and understanding the problem after watching me do it on the board. There will be a quiz at the beginning of each class on Friday.

HOMEWORK: Homework will be assigned after each section. We will discuss the homework, but most of it will not be collected. Throughout the semester, several computer projects will be assigned that will need to be typed in LaTeXand handed in for grading. Each project will be worth 10-15 points. More information on the computer projects will be handed out in class.

QUIZZES: There will be a 10 point quiz at the beginning of class each Friday. This quiz will cover material through the previous class. Quiz questions will be similar (but not identical) to homework problems. You should know definitions, statements of theorems and proofs of small results for the quizzes. Vocabulary in this course is very important. It is recommended that you write definitions and statements of theorems on index cards as we go through the semester. Use the cards to study for quizzes and tests. *You do not need to know the definition exactly word for word, but it must be* **correct** *and* **complete** *to receive credit on a quiz or exam.* The 10 best quiz scores will be kept, and the rest will be dropped. There will be no make up quizzes given.

MIDTERMS and FINAL: There will be three midterms and one final exam during the semester each of which is worth 100 points. You should be prepared to write original proofs on the exams, as well as know the definitions and statements of theorems. If you cannot make it to a scheduled exam, you MUST contact the instructor BEFORE the exam if at all possible, or if an emergency, WITHIN 24 HOURS after the exam if you need to schedule a make up exam. Make up exams will only be given for extreme excuses. A doctor's note or some other physical excuse is required.

GRADING: Grades will be assigned on the following scale:

A: 90-100%, B: 80-89%, C: 70-79%, D: 60-69%, F below 60%

Points are assigned as follows:

Quizzes (10) - 100 points
Midterm exams (3) - 100 points each
Homework Projects - 80-100 points
Final exam - 100 points

ADDITIONAL HELP: You are encouraged to work together in this class and form study groups. TALK about mathematics with each other. WRITE down your thoughts and ideas. SHARE these ideas with the class. Go to the library or internet and research topics that interest you or are difficult for you. You are welcome to e-mail questions to me, but if you are referring to a homework problem, please include the entire question, because I may not have access to a book when I answer your e-mail.

HONOR CODE You are to abide by the JMU honor code at all times. Ignorance of the law is no excuse. Cheating will not be tolerated and will be prosecuted to the fullest extent. When turning in homework or groupwork, you may work together and discuss the problems, but you must write up the homework to turn in **by yourself**. Every answer requires an explanation, and no two people's explanations will be exactly the same. Copying someone else's homework and putting your name on it is a violation of the Honor Code. *Do not share your LaTeXcode with anyone.* You are welcome to look at each other's code, but do not share files, and do not copy code from someone else word for word.

UNIVERSITY POLICIES For University policies for attendance, inclement weather, disability accommodations and religious accommodations, please see: `http://www.jmu.edu/syllabus/`

FIRST WEEK ATTENDANCE POLICY: At the instructor's discretion, any student registered for a class in the Department of Mathematics and Statistics who does not attend at least one of the first two scheduled meetings of the class (or does not attend the first scheduled meeting of a class that meets once a week) MAY be administratively dropped from the class. Students will be notified by e-mail if they will be dropped. Students who fail to attend should not assume they will be administratively dropped by their instructor; it is the students responsibility to drop the course on their own or they will receive a grade at the end of the semester. All students are responsible for verifying the accuracy of their schedules and changes made in their schedules.

LEARNING: Your goal in this class is to learn Geometry. My role is to facilitate that learning. You will get out of this class what you put in to it. There are no shortcuts. Learning is not easy. It takes effort and persistence. It is a struggle. Do not see your mistakes as failures, but rather as learning opportunities! It is the struggle that leads to learning. Embrace the challenge.

Math 475 Homework

Note: This list is tentative.

Section 1.3: **Project 1.3** The Ratio Made of Gold

Section 1.4: 3-11

Section 1.5: 1, 4-15

Section 1.6: 2, 3, 7-11

Section 1.7: **Project 1.7** A Concrete Axiomatic System

Section 2.1: 1,2, 5-10

Section 2.2: 1-11, 15

Section 2.3: 1-5 (These questions are from a project which you do not need to turn in)

Section 2.4: 1-9 (These questions include mini-project 2.4.1 which you do not need to turn in)

Section 2.5: 1-4, 7

Section 2.6: 1-7, 11, 12, 15

Section 2.7: **Project 2.7** Circle Inversion

Section 5.1: 1-12

Section 5.2: 4, 6-9, 11

Section 5.3: 4-7

Section 5.4: 1,2, 4,5, 7, 9;

Section 5.6: 5-11

Section 7.2.2 **Project** The Klein Model

Section 7.3: 1-3, 6, 7

Section 7.4 **Project** The Saccheri Quadrilateral

Section 7.5: 1-6, 9, 11,13

Section 7.6: 2,3

Chapter 8: TBA

Chapter 9: TBA

Section 9.3: 1-5

Section 10.4 **Project** An Endlessly Beautiful Snowflake

Section 10.6: 1-3, 6-8

Section 10.7 **Project** (Optional) IFS Ferns