Syllabus for Math 475, *Fundamentals of Geometry*, Fall 2012

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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 and 9 of the text.

TEXT: *Geometry with Geometry Explorer* by Michael Hvidsten. This text is currently out of print. However, the author has allowed us to use the pdf file for the book. You may download the file from this site: `http://educ.jmu.edu/ arnoldea/book.pdf` It is a large file, 5.5MB, so be sure to use high speed internet. Once you have the file, you may have it printed and bound at a copy store such as Kinko's. Or you may use it electronically, or print out chapters as we need them. If you prefer a traditional book, there are used copies available at Amazon.com. The software Geometry Explorer can be downloaded here: http://homepages.gac.edu/ hvidsten/gex/download-2.0.2.html.

LATEX: In this class, we will use the mathematical typesetting program LaTeX. LaTeX is the standard typesetting tool of mathematicians all over the world. Whether you will be teaching, working in business or in academia, LaTeX is useful for preparing mathematical documents. See my website for information on installing and running LaTeX. A useful text for learning and using LaTeX is *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 LaTeX and handed in for grading. Each project will be worth 10-15 points. For each project, 2 of the points will by for typesetting in LaTeX. The remaining points will be for the correctness of the project. You may turn in a hand written project, but you would forfeit the 2 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 in-class 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. Dates for exams (subject to change):

> Midterm I Friday September 28
> Midterm II Friday October 26
> Midterm III Friday November 30
> **Final Exam** - Friday December 14, 10:30-12:30pm

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.

Math 475 Homework

Note: This list is tentative.

Section 1.4: 3-11

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

Section 1.5: 1, 4-10

Section 1.6: 2, 3, 5-11

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

Section 2.1: 1-3, 5-10

Section 2.2: 1, 4-12

Section 2.3: **Project** Special Points of a Triangle

Section 2.4: 1-10 (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: 1-8, 12

Section 2.7: **Project** Circle Inversion

Section 5.1: 1-12

Section 5.2: 4, 6-9, 11

Section 5.3: 4-6, 8

Section 5.4: 1,2, 4,5, 7,8,9;

Section 5.5 **Project** Quilts and Transformations

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

Section 9.3: 1-5

Section 9.4 **Project** An Endlessly Beautiful Snowflake

Section 9.6: 1-3, 6-8

Section 9.7 **Project** IFS Ferns