

Shimer College
THE NATURE AND CREATION OF MATHEMATICS
IS2
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In this course we will participate in a 2300 year old conversation about a logical question, “Is Euclid’s parallel postulate a real postulate or a theorem?” We will begin with some logic games to get acquainted with the ideas of logical systems, and how we tests for consistency and independence. We look at Aristotle and Descartes for ideas about how we find out what is true and how we prove it. We look at Euclid to see an example of a method of proving statements about geometrical objects, and we look at Lobachevsky to see a different geometrical system. Einstein’s theory of relativity shows how to deal with an inconsistency in the postulates of classical mechanics that we got from Newton. And we conclude by studying Gödel’s examination of the question of whether the consistency of arithmetic can be proven.

The Learning Objectives are:

1. Demonstrate technical understanding of a geometric proof(s).
2. Show how to judge the validity and truth of a given statement or series of statements.
3. Relate premises to conclusions in a logical manner.
4. Explain the meanings of “completeness” and “consistency” in axiomatic systems.
5. Show understanding of the uses and limitations of axiomatic systems.
6. Argue effectively about the plausibility/reasonableness of axioms, definitions, postulates, and theorems in an axiomatic system.
7. Explain the uses and limitations of charts, graphs, and other models in explanations in logic and mathematics.

I expect you to come to each class (two absences are the maximum) with questions or comments about the reading, to share those with your classmates, and to help one another answer those questions. It is your questions that must be answered, and only you can ask them. This is a joint effort in which we will all participate, along with Aristotle, Euclid, Descartes, Lobachevski, Nagel and Newman, and others.

Please, no cell phones or other interruptions in class. If you are more than 5 minutes late this will count as tardy, and if you are tardy 3 times that will count as one absence.

I expect each of you to keep a **journal** of your work and your reflections and reactions to your readings. I will collect them from time to time.

In order to receive credit for this course you must **participate** in the class discussions, **turn in your journals** on time, and **pass the three exams**.

Welcome

The Nature and Creation of Mathematics
 Fall 2011
 Tentative Schedule of Readings

1 Fri 26 Aug	<i>Bits and Bins</i> , Begun in class
2 Tue 30 Aug 3 Fri 2 Sep	<i>Bits and Bins</i> ; <i>A Little Reasoning</i> ; Aristotle <i>On Interpretation</i> , Ch.10 – 12 <i>A Little Reasoning</i> ;
4 Tue 6 Sep	<i>A Little Reasoning</i> ; Aristotle, <i>Prior Analytics</i> , I, 2, 4, 9; <i>Posterior Analytics</i> , I, 1-3, 7-10,
5 Fri 9 Sep	Aristotle, <i>Posterior Analytics</i> , I, 10-19;
6 Tue 13 Sep	Aristotle, <i>Posterior Analytics</i> , I, 1-3, 7-19, II, 19; Euclid, <i>Elements</i> , I Definitions, Postulates, and Axioms; Prop 1 – 4 Collect Journals
7 Fri 16 Sep	Euclid, <i>Elements</i> , I Definitions, Postulates, and Axioms; Propositions 1-6, 13-17
8 Tue 20 Sep 9 Fri 23 Sep	Euclid, <i>Elements</i> , I Propositions 13 – 16; 27 - 32 Euclid, <i>Elements</i> , I Propositions 33 – 35; 41, 47 Take Home Exam 1
10 Tue 27 Sep	Take Home Exam 1 Due , reviewed; Descartes, <i>Rules for the Direction of the Mind</i> ; <i>Method, Parts 1 & 2</i> .
11 Fri 30 Sep	Descartes, <i>Method, Parts 1 - 4</i> . Compare Descartes with Aristotle.
12 Tue 4 Oct	Lobachevsky, <i>Theory of Parallels</i> , 1-16 Dean's Break
13 Tue 11 Oct 14 Fri 14 Oct	Lobachevsky, <i>Theory of Parallels</i> , 16-24. Collect Journals Lobachevsky, <i>Theory of Parallels</i> , 16-24.
15 Tue 18 Oct 16 Fri 21 Oct	Newton, <i>Principia</i> , Definitions, Laws of Motion, Scholium Einstein, <i>Relativity</i> , Ch. 1 – 6.
17 Tue 25 Oct 18 Fri 28 Oct	Einstein, <i>Relativity</i> , Ch. 1 – 10. Einstein, <i>Relativity</i> , Ch. 1 – 12.
19 Tue 1 Nov 20 Fri 4 Nov	Einstein, <i>Relativity</i> , Ch. 1 – 16. Take Home Exam 2 Take Home Exam 2 Due , reviewed; <i>Gödel's Proof</i> , 1 – 56. Collect Journals
21 Tue 8 Nov 22 Fri 11 Nov	<i>On Paradox</i> ; <i>Gödel's Proof</i> , 57-91 <i>Gödel's Proof</i> , 57-91
23 Tue 15 Nov 24 Fri 18 Nov	<i>Gödel's Proof</i> , 92-113. <i>Gödel's Proof</i> , 92-113. Final Exam Part 1, take home

Thanksgiving Holiday

25 Tue 29 Nov	Final Exam Part 1 Due , Reviewed; <i>Gödel's Proof</i> , 92-113; Review of course
26 Fri 2 Dec	Final Exam Part 2 Collect Journals