

Meets: 2:00 - 3:20 MW in Tech LG76.

Professor: David McClendon (Lunt B2, phone 467-1298, hours MW 12:00 - 1:30, dmm@math.northwestern.edu)

Book: *Philosophy of Mathematics: Selected Readings* edited by Benacerraf and Putnam. Other readings will be distributed in class.

Web: There will be a Blackboard page maintained at courses.northwestern.edu. Additional information may be posted at www.math.northwestern.edu/~dmm.

Grading policy: There will be frequent writing assignments throughout the quarter (two in-class, the rest to be done at home) that count for 70% of the grade. Class participation counts for the other 30%.

Academic dishonesty: Issues with academic dishonesty are taken very seriously and will be referred directly to the Dean's Office. Do not plagiarize - there is no punishment for using other sources if you cite them.

Tentative Course Schedule as of September 21, 2007:

DATE	TOPIC
Wed 9.26	Course Introduction Issues with academic dishonesty, plagiarism, and citations
Mon 10.1	What makes good writing? Peer reviews of first paper
Wed 10.3	The Greek viewpoint of mathematics Read: selections from <i>The Elements</i> First paper due
Mon 10.8	Plato vs. Aristotle Read: Book VII of <i>The Republic</i> p. 249-263
Wed 10.10	The views of Kant and Mill Read: Shapiro p. 73-103
Mon 10.15	Logicism Read: BP p. 130-151 (Frege)
Wed 10.17	Russell's Paradox
Mon 10.22	Logical Positivism Read: BP p. 241-257 (Carnap)
Wed 10.24	In-class Writing Exercise
Mon 10.29	Formalism and the Hilbert program Read: BP p. 183-201 (Hilbert)
Wed 10.31	Godel's Incompleteness Theorem Peer reviews of second paper
Mon 11.5	Intuitionism Read: BP p. 90-96 (Brouwer) Second paper due
Wed 11.7	Realism Read: BP p. 355-361, 363-365, 374-376 (Quine) Peer reviews of third paper
Mon 11.12	Fictionalism Read: Shapiro p. 226-237 Third paper due
Wed 11.14	Structuralism and Coherentism Read: Shapiro p. 257-289
Mon 11.19	In-class Writing Exercise
Wed 11.21	No class - Thanksgiving
Mon 11.26	Beauty in Mathematics Read: selections from <i>A Mathematician's Apology</i>
Wed 11.28	Peer-editing session of fourth paper
Wed 12.5	Fourth paper due

Legibly write a paper which is the equivalent of 2-3 typed pages (this is roughly 5-6 long paragraphs - the actual length of your paper depends heavily on your handwriting). The time limit is 25 minutes. The topic is:

What/who is your favorite (or least favorite) _____?

Fill in the blank with whatever you want. Here are some suggestions:

- color
- season (or month)
- artist (or sculptor or sculpture or painting or style of art)
- book (or magazine or or poem or author or poet)
- play (or musical)
- composer (or band or singer or style of music)
- movie (or TV show or TV channel or actor or director)
- hobby (or game or sport or athlete or sports team)
- food (or drink)
- aspect of Northwestern (or aspect of Evanston)
- thing about your hometown

Earlier this quarter we read Euclid's *Elements*, which can be thought of as a treatment of geometry which can be derived from certain axioms, which must be assumed without proof.

In the early 20th century, Ernst Zermelo and Abraham Fraenkel decreed a list of axioms (called the ZFC axioms) on which **set theory** can be based. They set forth exactly what collections of objects can be thought of as "sets" (and disallow collections like the "set" constructed in Russell's paradox). These axioms are assumed in virtually every branch of modern mathematics. Two of the more interesting axioms are the following:

- The axiom of infinity
- The axiom of choice

Pick one of these axioms (you may also pick any of the other (boring) ZFC axioms and alternatively you may also examine the Continuum Hypothesis proposed by Georg Cantor); describe it and place it into context with regard to our course. Some things to consider might include:

- What is the statement of the axiom (you could give a precise mathematical statement and/or a real-world translation of the statement)? Why is this axiom necessary in mathematics? What applications of mathematics implicitly rely on this axiom?
- Is this axiom controversial? What kind of person might argue against the truth of this axiom? What kind of person might strongly argue for the truth of this axiom?
- How might mathematician-philosophers before the time of Zermelo and Fraenkel (this means Plato, Aristotle, Kant and/or Mill) have reacted to this axiom?
- Do you "believe" the axiom? Why or why not?

Note: it is better to pick a few of these questions and cover them in depth than to say just a little bit about all these questions.

Length: 2.5 to 4 pages

Drafts will be peer-reviewed on Wednesday, October 31

Final drafts are due Monday, November 5 (as before, you will need to turn in your draft, review sheets and your final product)

Read pages 403-420 in Benacerraf/Putnam. This is an essay on mathematical “truth” originally written by Paul Benacerraf in 1973. Compare the ideas Benacerraf sets forth in this paper about truth and knowledge (in the context of mathematics) with those of Plato. Argue why you think they hold different viewpoints.

Length: 4-5 pages

Drafts will be peer-reviewed on Wednesday, November 7.

Final editions are due Monday, November 12 (you will need only to turn in your final version and the names of those who reviewed your rough draft).

In 1998 an international group (namely, the Senior Assessment Panel for the International Panel of the Mathematical Sciences) was convened to discuss the role of mathematics in society. One of the questions they examined was the following:

Why should anybody but mathematicians care about the standing of mathematics in the real world?

Their response to this issue included the following memorable phrase:

“Mathematics has a dual nature: it is both an independent discipline valued for precision and intrinsic beauty, and it is a rich source of tools for the world of applications. Mathematics might be described as having abstractness internally and effectiveness externally.”

Throughout the quarter we have studied many viewpoints on the philosophy of mathematics. Pick some of the thinkers we have discussed and consider how they would respond to the same question considered by the Senior Assessment Panel, as well as how they might agree or disagree with the answer given by the Senior Assessment Panel. Finally give your personal views on the standing of mathematics in the world, relating your views to both elements from the quote from the Senior Assessment Panel and viewpoints of philosopher/mathematicians we have discussed.

Length: 5.5 - 8 pages

Drafts will be peer-reviewed on Wednesday, November 28.

Final versions should be turned in by Wednesday, December 5 (before I go home on that day). You should submit a final edition (and only the final edition) to me in one of the following forms:

- A hard copy (slide under my office door) OR
- An electronic file (via email attachment at `dmm@math.northwestern.edu`). Your file should be in either *.doc or *.pdf format.