

MA 330 002, History of Mathematics¹ University of Kentucky, Spring 2012

CONTENTS

1. General Information	1
2. Course Description	2
3. Tentative Schedule	5
Mathematical origins	5
The Pythagorean theorem arises	5
Euclid and the process of heroification	5
Islamic contributions	6
Estimating π , from ancient to contemporary times	6
The joy of infinite series	6
Leonhard Euler	6
The nature of infinity and mathematical progress	6
Final discussion meeting time	6
4. Assessment and Grades	7
5. Course Expectations	7
6. Classroom and Learning Accommodations	8
7. Writing Intensive Course Information	8
Student Eligibility	8
Learning Outcomes	8
Minimum Writing Requirements	8
Grading Policies	8
Plagiarism	9
Assessment	9
Information	9

1. General Information

Prof. Benjamin Braun

Course Webpage: www.ms.uky.edu/%7ebraun

Email: benjamin.braun@uky.edu

Office Phone: 257-6810

Class Time/Location: 12:00-12:50PM, MWF, CB 345

Office Location/Hours: 831 POT, MW 9AM, F 10AM, and by appointment

Course Texts:

- *Journey Through Genius: The Great Theorems of Mathematics*, 1991, by William Dunham.
ISBN-10: 014014739X

¹I reserve the right to change or amend this syllabus at any time for any reason.

- *Lies My Teacher Told Me: Everything Your American History Textbook Got Wrong*, updated and revised edition from 2007, by James W. Loewen. ISBN-10: 0743296281
- *The Crest of the Peacock: Non-European Roots of Mathematics*, third edition, by George Gheverghese Joseph. ISBN-10: 0691135266

2. Course Description

It isn't at all clear what a course on the History of Mathematics should be. Is it a history course with some math in it? Is it a math course where historical tidbits are tossed in? Should it only cover mathematics that students have already seen, or only mathematics that is new to them, or a blend of both? Should it be an easier course ("the last requirement for my math minor") or a challenging one ("now I really understand Lebesgue integration")?

For what it's worth, I don't have good answers to these questions either, because in my ideal world, this course wouldn't exist. If mathematics was taught the way I think is best, it would already include enough history, or solid glimpses of history, to make this class irrelevant. Also, these historical glimpses would inform our vision of how mathematics develops, and of who it is that helps mathematics grow. This line of thought always leads me back to wondering what the point of university study is, what you (the student) should gain from coming to this class, from reading the texts that are offered, from completing the course assignments.

So what do you want to get from this course? There are lots of things that I think students can get out of this course, but if I write them down, they won't mean as much. You can get some idea of my thoughts from the reading schedule for the course. Instead of telling you what you should think, let's get our thoughts flowing with the thoughts of others.

The most important thing I learned in this class is that I have the ability to comprehend things that are very difficult, and have not been taught to me.

FORMER MA 330 STUDENT

I learned a great deal from taking this course; however, I do not think what I learned was exactly what I was supposed to learn.

FORMER MA 330 STUDENT

One of the disappointments experienced by most mathematics students is that they never get a course on mathematics. They get courses in calculus, algebra, topology, and so on, but the division of labor in teaching seems to prevent these different topics from being combined into a whole. In fact, some of the most important and natural questions are stifled because they fall on the wrong side of topic boundary lines... Thus if students are to feel they really know mathematics by the time they graduate, there is a need to unify the subject.

Mathematics and its History

JOHN STILLWELL

The principal aim of mathematical education is to develop certain faculties of the mind, and among these intuition is not the least precious. It is through it that the mathematical world remains in touch with the real world.

It is by logic that we prove, but by intuition that we discover.

Science et méthode

HENRI POINCARÉ

So we teach to build intuition, and intuition enables our students to make discoveries. Notice that Poincaré does *not* say that the principal aim of teaching is to convey facts or theorems. The principal aim of mathematical teaching is to build qualities of mind that enable students to make discoveries.

Teaching Research, Encouraging Discoveries

FRANCIS SU

For good reasons and bad, students typically define their skill by reproducing rather than questioning or revising the work of their teachers (or the work of those their teachers ask them to read). It is important to read generously and carefully and to learn to submit to projects that others have begun. But it is also important to know what you are doing – to understand where this work comes from, whose interests it serves, how and where it is kept together by will rather than desire, and what it might have to do with you. To fail to ask fundamental questions – Where am I in this? How can I make my mark? Whose interests are represented? What can I learn by reading with and against the grain? – to fail to ask these questions is to mistake skill for understanding, and it is to misunderstand the goals of a liberal education.

Ways of Reading

DAVID BARTHOLOMAE AND ANTHONY PETROSKY

We must find ways to restore the child-like curiosity of college students. I see that 8th graders are more curious, more willing to probe with a “why?,” more willing to ask questions if they don’t understand, and more willing to let you know your pen is leaking in your front pocket. Somewhere along the path to adulthood, they lose the ability to ask questions.

Teaching Research, Encouraging Discoveries

FRANCIS SU

We learned that if our students had reading problems when faced with long and complex texts, the problems lay in the way they imagined a reader – the role a reader plays, what a reader does, why a reader reads (if not simply to satisfy the requirements of a course). When, for example, our students were puzzled by what they read, they took this as a sign of failure. (“It doesn’t make any sense,” they would say, as though sense were supposed to be waiting on the page, ready for them the first time they read through.) And our students were haunted by the thought that they couldn’t remember everything they had read...or if they did remember bits and pieces, they felt that the fragmented text they possessed was evidence that they could not do what they were supposed to do. Our students were confronting the experience of reading, in other words, but they were taking the problems of

reading – problems all readers face – and concluding that there was nothing for them to do but give up. . .

Our students need to learn that there is something they can do once they have first read through a complicated text; successful reading is not just a matter of “getting” an essay the first time. . . You work on what you read, and then what you have at the end is something that is yours, something you made.

Ways of Reading

DAVID BARTHOLOMAE AND ANTHONY PETROSKY

“I’m not very good at problems,” admitted Milo.

“What a shame,” sighed the Dodecahedron. “They’re so very useful. Why, did you know that if a beaver two feet long with a tail a foot and a half long can build a dam twelve feet high and six feet wide in two days, all you would need to build Boulder Dam is a beaver sixty-eight feet long with a fifty-one-foot tail?”

“Where would you find a beaver that big?” grumbled the Humbug as his pencil point snapped.

“I’m sure I don’t know,” he replied, “but if you did, you’d certainly know what to do with him.”

“That’s absurd,” objected Milo, whose head was spinning from all the numbers and questions.

“That may be true,” he acknowledged, “but it’s completely accurate, and as long as the answer is right, who cares if the question is wrong? If you want sense, you’ll have to make it yourself.”

The Phantom Tollbooth, 50th Anniversary Edition

NORTON JUSTER

In order to appreciate [*Finnegans*] *Wake*’s reader-friendliness, however, one has to abandon two assumptions about the act of reading which frequently exist side-by-side (though they are, on the surface at least, contradictory). One is that reading is an act of mastery whereby the text is made to yield up all its secrets and allowed to hold nothing back; the other is that reading is a passive experience whereby the reader receives meanings unambiguously communicated by the text. The *Wake* will never be mastered. . . More than this, however: the *Wake* teaches us, in a most delightful way, that *no* text can be mastered, that meaning is not something solid and unchanging beneath the words, attainable once and for all. All reading, the *Wake* insists, is an endless interchange: the reader is affected by the text at the same time as the text is affected by the reader, and neither retains a secure identity upon which the other can depend.

“Reading Joyce,” in *The Cambridge Companion to James Joyce*

DEREK ATTRIDGE

I confess that I’m a little bored with adults who cannot get in touch with their inner child, and I know, without a shadow of a doubt, that children are as well. We are

wrong to expect that all readers will understand every nuance of a book at the same time. But all readers do find delights in the twists and turns of a good tale.

“Celebrations of The Phantom Tollbooth,” in *The Phantom Tollbooth, 50th Anniversary Edition*

PAT SCALES

3. Tentative Schedule

Next to each date is listed the material that should be read prior to class.

Abbreviations:

JTG = Journey Through Genius

Lies = Lies My Teacher Told Me

Crest = The Crest of the Peacock

Jan 11:

Jan 13: JTG: Preface

Crest: Preface to the First Edition

Lies: Introduction: Something has gone very wrong (NOT the intro to 2nd edition)

Course Syllabus

Mathematical origins.

Jan 16: No Class: MLK Holiday

Jan 18: JTG: Ch 1, pgs 1–17

Jan 20: JTG: Ch 1, pgs 17–26

Jan 23: Crest: Ch 1

Jan 25: Crest: Ch 3, pgs 79–102

Jan 27: Crest: Ch 3, pgs 102–109

Jan 30: Crest: Ch 4, pgs 125–142 and 150–155

The Pythagorean theorem arises.

Feb 1: JTG: Ch 2, pgs 27–44

Feb 3: JTG: Ch 2, pgs 44–53

Feb 6: Crest: Ch 4, pgs 159–169 and Ch 5, pgs 177–178

*** Course Project Proposal Due ***

Feb 8: Crest: Ch 6, pgs 188–198 and Ch 7, pgs 246–261

Feb 10: Crest: Ch 8, pgs 311–317 and pgs 323–334

Euclid and the process of heroification.

Feb 13: JTG: Ch 3, 61–75

Feb 15: JTG: Ch 3, 75–83

Feb 17: Lies: Ch 1

Feb 20: Lies: Ch 2

Islamic contributions.

Feb 22: Crest: Ch 11, pgs 450–466

Feb 24: Crest: Ch 11, pgs 475–487

Feb 27: Crest: Ch 11, pgs 487–494 and 508–512

Feb 29: No reading

Mar 2: PEER EDIT DAY: First Version of Course Project Due

Estimating π , from ancient to contemporary times.

Mar 5: JTG: Ch 4, pgs 84–99

Mar 7: JTG: Ch 4, pgs 99–112

Mar 9: Crest: Ch 7, pgs 261–270

*** Spring Vacation: March 12–16 ***

Mar 19: JTG: Ch 7, pgs 155–165

Mar 21: JTG: Ch 7, pgs 165–174

Mar 23: JTG: Ch 7, pgs 174–183

The joy of infinite series.

Mar 26: Crest: Ch 9, pgs 403–406 and Ch 11, pgs 494–495

Mar 28: JTG: Ch 8, pgs 184–196

Mar 30: JTG: Ch 8, pgs 196–198, 202–206

Leonhard Euler.

Apr 2: JTG: Ch 9, pgs 207–212

Apr 4: JTG: Ch 9, pgs 212–222

Apr 6: JTG: Ch 10, pgs 223–229

Apr 9: JTG: Ch 10, pgs 229–244

Apr 11: No reading

Apr 13: Final Version of Course Project Due

The nature of infinity and mathematical progress.

Apr 16: Lies: Ch 11

Apr 18: JTG: Ch 11, pgs 245–258

Apr 20: JTG: Ch 11, pgs 259–266

Apr 23: Re-read the course syllabus

Apr 25: Lies: Ch 13

Apr 27: No reading

Final discussion meeting time.

Final: 1PM, Wed, May 2nd, 2012.

4. Assessment and Grades

- *Attendance and Participation*
 - You must be present and engaged in class discussion each day. I will take attendance each day.
 - Engagement does not mean you have to talk every day, or meet some quota of comments. It means you have to listen to what other people are saying and share your thoughts from time to time.
 - Your participation grade will be largely subjective. If you have any concerns, come talk with me about them.
 - You are allowed 3 unexcused absences. Beyond that, you will lose 2% of your overall course grade for each unexcused absence.
- *Assignments*
 - I will give assignments regularly. Some portions of the assignments must be typed.
 - *WARNING:* No late work will be accepted.
- *Course Project*
 - You will choose a topic for and complete a major project related to the history of mathematics during the course of the semester. This will be a written project of length (without references) 16-20 pages with 1 inch margins, 12 point Times New Roman font, double spaced. The main requirement is that your project must involve a “great idea” of mathematics and provide a well-supported argument justifying this choice of topic. All projects are expected to be well-written, free from grammatical errors, and have excellent mathematical depth and style. A grading rubric will be provided early in the semester.
 - You should direct a significant portion of your project toward a general university audience and articulate clearly which sections are aimed toward experts. *Journey Through Genius* is a good model for this type of exposition.
 - You will turn in a first version of your project for peer review; the first version must be a complete project that you will revise substantially to create your final version.

Your total grade will be determined by your attendance and participation, assignments, and project. The grading scale will be no stricter than the usual A>89.9, B>79.9, C>69.9, D>59.9, E otherwise, weighted as follows:

- Attendance and Participation: 10%
- Assignments: 35%
- Project:
 - First Version: 15%
 - Final Version: 40%

5. Course Expectations

All students are expected to follow the academic integrity standards as explained in the University Senate Rules, particularly Chapter 6, found at:

http://www.uky.edu/Faculty/Senate/rules_regulations/index.htm

Turn off all cell phones, pagers, etc. prior to entering the classroom. *You are not to use your cell phones, pagers, or other electronic devices during class.* An attitude of respect for and civility towards other students in the class and the instructor is expected at all times.

6. Classroom and Learning Accommodations

Any student with a disability who is taking this course and needs classroom or exam accommodations should contact the Disability Resource Center, 257-2754, room 2 Alumni Gym, jkarnes@uky.edu.

7. Writing Intensive Course Information

Student Eligibility. This is a writing-intensive (W) course approved to fulfill the upper tier of the graduation writing requirement (GWR). To receive W credit for this course, you must have successfully completed the first-year writing requirement (ENG 104 or its equivalent) and have completed at least 30 hours of coursework.

Learning Outcomes.

- Write a paper that is essentially free of mechanical errors (grammar, punctuation, spelling, and syntax) and awkwardness, using a style that is appropriate to the purpose and audience.
- Demonstrate an ability to discover, evaluate, and clearly present evidence in support of an argument in the subject area and utilize documentation that conforms to the formats and the citation conventions of the subject area.
- Be aware that composing a successful text frequently takes multiple drafts, with varying degrees of focus on generating, revising, editing, and proofreading.
- Write a capable, interesting essay about a complex issue (discipline-specific) for a general university audience.

Minimum Writing Requirements.

- Students will be required to write a minimum of 15 pages of formal writing.
- At least 10 of these pages must be single-authored assignments.
- No assignments requiring fewer than 4 pages may be included in the 15-page minimum.
- These 15 pages must go through a draft, review, and revision process. Peer review is sufficient to meet the review requirement.

Grading Policies. To pass the course, students must earn a grade of C or higher on ALL FORMAL assignments. Instructors can consider additional formal writing, writing other than the formal writing, or additional projects and assignments in the final grade computation. Thus, students can receive lower than a C as a final grade and still receive GWR credit. Any major assignment that receives a D or below must be revised to reflect competency and resubmitted. Instructors may limit the number of revision attempts and set time restrictions on revisions. At the discretion of the instructor, students who fail to achieve competency may receive an I (incomplete) grade, but

in no case may a student whose writing fails to reach the level of C (competent) receive a passing grade in a course that satisfies the University Writing Requirement.

Plagiarism. Part II of Student Rights and Responsibilities (6.3.1; online at <http://www.uky.edu/StudentAffairs/Code/part2.html>) states that all academic work written or otherwise submitted by students to their instructors or other academic supervisors is expected to be the result of their own thought research or selfexpression. In cases where students feel unsure about a question of plagiarism involving their work they are obliged to consult their instructors on the matter before submission.

When students submit work purporting to be their own but which in any way borrows ideas organization wording or anything else from another source without appropriate acknowledgment of the fact the students are guilty of plagiarism.

Plagiarism includes reproducing someone else's work whether it be published article chapter of a book a paper from a friend or some file or whatever. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work which a student submits as his/her own whoever that other person may be. Students may discuss assignments among themselves or with an instructor or tutor but when the actual work is done it must be done by the student and the student alone.

When a student's assignment involves research in outside sources or information the student must carefully acknowledge exactly what where and how he/she has employed them. If the words of someone else are used the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Plagiarism also includes making simple changes while leaving the organization content and phraseology intact. However nothing in these Rules shall apply to those ideas which are so generally and freely circulated as to be a part of the public domain.

Assessment. Students must submit an ungraded copy of one of their minimum four page papers to the instructor for SACS assessment. This paper should contain only your student id number (NOT SOCIAL!) listed at the top of the page. All other identifying information (student name, instructor name, course and section number, etc) should be removed. The student id or billing number is located on the right hand corner of the student ID card.

Information. Questions about the W option should be referred to the Director of the UK Writing Initiative, Professor Janet Carey Eldred, eldred@uky.edu