

MONT 104Q – Mathematical Journeys
Information for Midterm Exam
October 14, 2015

General Information

The midterm exam announced in the course syllabus will be given in class on Monday, November 2. The whole class period will be devoted to the exam.

Miscellaneous Groundrules

No use of cell phones, pagers, I-pods, I-pads, or any other electronic devices will be allowed during the exam. There will not be any numerical computations requiring use of a calculator. You will be asked to turn all devices off and stow them in your backpack.

What Will Be Covered

The exam will cover the mathematical and historical material we have studied since the start of the semester (i.e. starting from our discussion of Hardy's *Mathematician's Apology*), through the end of our discussion of the *Elements* of Euclid.

This means in particular:

1. Know the approximate historical periods of the following figures: Pythagoras, Plato, Euclid, G.H. Hardy, where they came from (if known), and where they were active.
2. Know the statements and proofs of the two theorems Hardy gives as supreme examples of “real mathematics” (from the first group discussion day).
3. Know the 5 Common Notions (Axioms) and 5 Postulates that appear at the beginning of Book I of Euclid's *Elements*.
4. Know the statements and the proofs of Propositions 1 and 5 of Book I of the *Elements*. Be able to identify what Axioms, Postulates, and/or previously proved results are used in the proofs of these.
5. Know the statement and the proof of Proposition 47 in Book I of the *Elements*. For this one, you needn't memorize the numbers of the previous Propositions that are used in the proof (because there are quite a few). It will suffice just to say “by a previous proposition, we know”

Format

Approximately 65% of the exam will consist of questions related to the topics above. The remaining approximately 35% will be a short essay (target length: 1-2 handwritten pages). The essay will be on one of the two topics below (I will choose the one for the exam). To prepare well, you will want to think (and probably write) out practice essays on both topics. In the evaluation of the exam essay, I will be looking at the content and organization of what you are saying, but *not* at mechanical issues of grammar, punctuation,

spelling, etc. (I may not be able to resist correcting things, but any corrections I make as I read will not feature in the grading.)

The Essay Question

The essay question will be on *one of the following topics* (yes, these exact questions):

- 1) George G. Joseph, the author of an interesting book about the history of mathematics called *The Crest of the Peacock*, offered this overall evaluation of the ultimate impact of Greek geometry: “There is no denying that the Greek approach to mathematics produced remarkable results, but it also hampered the subsequent development of the subject. ... Great minds such as Pythagoras, Euclid, and Apollonius spent much of their time creating what were essentially abstract idealized constructs; how they arrived at a conclusion was in some way more important than any practical significance.” First, what does the last sentence mean? What is Joseph getting at? Then, based on what he said in *A Mathematician’s Apology*, how would G.H. Hardy respond to Joseph? Finally, which side of this debate do you come down on personally? Should all the mathematics we learn and do have practical usefulness or significance?
- 2) Peter Rudman, the author of a book about the extent to which the Pythagorean theorem was anticipated by work in the Old Babylonian period (about 2000 - 1600 BCE) wrote this: “High school mathematics education today, with its emphasis on creating high scores on standardized tests, all too often neglects the derivations where mathematics is learned and emphasizes memorizing the equations that provide quick solutions in the standardized tests but that are then rapidly forgotten” What are the “derivations” that Rudman is referring to? Why do you think he says that that “is where mathematics is learned?” How does what he is saying connect with things we read in Hardy’s *Mathematician’s Apology* and that we have done so far in this course? Does his description of high school mathematics match your experience?