

MONT 108N – Mathematics Through Time
Information for Midterm Exam
October 13, 2010

General Information

The first midterm exam will be given in class on Friday, October 29 (this is a week later than originally announced). It will cover the mathematical and historical material we have studied since the start of the semester (starting *after* the discussions of *The Immortal Life of Henrietta Lacks*).

This means in particular:

1. The “finished products” of high school level algebra
 - a. Base 2, 8, 10, 60, etc. positional number systems
 - b. Solving quadratic equations by factoring and the quadratic formula
 - c. Know the derivation of the quadratic formula via completing the square
 - d. Solving other forms of equations

2. Egyptian mathematics
 - a. Know the approximate historical period represented by our primary Egyptian mathematical sources (the Rhind and Moscow mathematical papyri).
 - b. Know the basic idea of their number system and the number symbols for 1’s, 10’s, 100’s, 1000’s (see page 40 in *The Babylonian Theorem*)
 - c. “Egyptian multiplication and division” by repeated doubling
 - d. Egyptian computations with unit fractions via tables of representations like the one from the Rhind papyrus on page 44 of *The Babylonian Theorem*); also know that there are many different representations for fractions as sums of unit fractions.
 - e. Be prepared for problems like the ones on Problem Set 2.

3. Old Babylonian mathematics
 - a. Know the approximate historical period represented by the Old Babylonian mathematical texts.
 - b. Know their base-60 number system and number symbols and be able to read our simplified form and “the real thing”
 - c. The role of addition, multiplication, reciprocal, $n^3 + n$, ... tables in Babylonian arithmetic
 - d. Know the different interpretations of the Babylonian “quadratic algebra” problem texts like YBC 6967 given by Otto Neugebauer, Jens Hoyrup, and Peter Rudman.
 - e. Know what is on the “Plimpton 322” tablet and why this provides evidence for Rudman’s interpretation of the “quadratic algebra” problem texts.

Format

Approximately 60% of the exam will consist of two or three short mathematical problems similar in format and content to the ones you have seen on the problem sets. The remaining approximately 40% will be distributed, in a way to be determined, among a few multiple choice questions, short answer questions, and a short essay. This 40% will concentrate on aspects of the history.

Essay

The essay question will be one of the following:

- 1) “The distinguishing feature of Babylonian mathematics is its algebraic character.” Of the historians we have mentioned, who would agree with this claim, and who would disagree? Explain using the the interpretations your historians would give for the YBC 6967 problem of solving the equation $x = 60/x + 7$.
- 2) How are the Egyptian and Old Babylonian ways of dealing with fractions different from each other, and different from what we do today? Which of these three systems has the capability of dealing with more fractions *in exact, finite terms* (that is, without resorting infinite repeating expressions)? Explain.
- 3) Getting on his soapbox, Rudman states that “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” Is today’s approach really all that different, though, from the Egyptian and Old Babylonian problem texts we have seen, where solutions of the problems posed are given as series of “do this, then do that” steps for solving the problems?

Miscellaneous Groundrules

No use of cell phones, pagers, I-pods, or any other electronic devices beyond a calculator will be allowed during the exam – turn them off and stow them in your backpack.