SF2719/SF2725 The History of Mathematics
Exam
Friday, October 25, 2019

Time: 08:00–13:00
Allowed aids: Swedish-English and/or English-Swedish dictionary
Lecturer: Tilman Bauer
Examiner: Tilman Bauer

This exam consists of three parts, each giving up to 12 points. The grade requirements are:

	E	D	C	B	A
minimum points	18	21	24	27	30
of which on part A at least	4	4	4	4	4
and on part B at least	4	4	4	8	10
and on part C at least	4	4	4	8	10

Students achieving at least 4 points on every part, but only 16 or 17 points in total, obtain the grade Fx with the possibility of completion to grade E.

PART A

Answer the following questions briefly. Every question gives up to 2 points. Questions 1 through 4 can be replaced by the in-class quizzes 1 through 4, respectively. If you answer one of these question and at the same time got points on the corresponding quiz, the maximum score will be taken.

1. State one geometric and one arithmetic theorem proved in Euclid's Elements.

2. What were Omar Khayyam's contributions to the problem of equation solving? Around what time did this happen?

3. What was the reason of the dispute between Leibniz and Newton? Would you side with one of them, and if so, why?

4. What is Russell's paradox and how did it affect the development of mathematics at the turn of the 20th century?

5. What is a syllogism, and what can you do with it?

6. Briefly state three obstacles that women mathematician faced. (Also state at what point in history, or the present, these obstacles existed.)

please turn over

This part consists of an analysis of an original text (or a translation thereof). Your bonus points from the homework essays 1 and 3 are added to the score achieved on this part. However, the total score cannot exceed 12.

7. Analyze the following translation of a text by Bolzano (1810) with respect to the questions:

- What does the author mean by applied mathematics? Does this meaning differ from our current meaning, and if so, how?
- Discuss, based on this text and possibly other evidence, what Bolzano would have thought about your undergraduate textbook on calculus or linear algebra.

Therefore in so far as one wishes to understand by *applied* mathematics something which is *essentially based on some propositions borrowed from experience*, I do not believe its existence can be justified. But one can also understand by the name *applied* mathematics something quite different, something which I prefer to call *practical*—or, with a term borrowed from the critical philosophy and perhaps more specific, *technical mathematics. This is an exposition of the mathematical disciplines specially set up for useful application to ordinary life*. Such an exposition is clearly distinguished from the *purely scientific* by the difference in *purpose*; that of the *latter* is the greatest possible *perfection of scientific form* and thereby also the *best possible exercise in correct thinking*, while that of the *former*, in contrast, *is direct usefulness for the needs of life*. Therefore in the practical exposition all the excessively *general views* which are not absolutely essential to the application can be dropped, while many *examples* and *special references to actual cases* can well be inserted. There is not the compulsion to note these actual cases as mere *possibilities* (as must happen in a purely scientific exposition), but they are put forward straight away as *realities* proved by experience. Moreover, I need hardly say that in most current textbooks of mathematics there is a basically *mixed* approach which aims at combining those two purposes, the purely scientific and the practical. However, it is not my opinion that this is generally a *fault* in those textbooks. A completely expedient textbook composed according to this *mixed* approach would in fact be a far more useful work than a purely scientific one. Only I believe the first cannot be achieved until the *purely scientific* system has been completed. Whoever works for the perfection of the latter can be allowed, for the time being, to put the *second* purpose completely out of his mind so as to fasten his attention solely on the *first*, the scientific perfection.

This part consists of an essay. It can be replaced by the accumulated points of homework essays 2 and 4. If you write an essay here and at the same time have points from homework essays 2 and/or 4, the maximum score will be taken.

Choose **one** of the following topics and treat it in an essay. The discussion of each topic must be based on or illustrated by concrete and specific examples.

8. Discuss the following claim: The fascination with the foundations of mathematics (logic, set theory, axioms, and precise definitions) in the late 19th century is a fin-de-siècle phenomenon.

OR

9. Describe how the institutional and organizational frameworks in which mathematics was done changed from the 17th century up to today, and what impact this had on how mathematics was done.

OR

10. Describe the history of our number system, from natural numbers to complex numbers.