

4400-001 - SPRING 2022 - FINAL EXAM INFORMATION AND TEMPLATE

Date, time, and location.

Thursday, April 28, 8:00 - 10:00am in M LI 1725 (usual classroom.)

See also below for information about an online option.

Online option. The exam may be taken on Zoom if you have a valid reason and pre-arrange it with me. The exam should only be taken online if you cannot take it in person due to medical or pre-approved scholastic reasons (for example, athletics or club trip). COVID exposure is an acceptable medical reason. To pre-arrange it, please send me an email (sean.howe@utah.edu) before 8:00pm on Wednesday, April 27; you will not be permitted to take the exam online otherwise. **There will be no exceptions to this policy - if you do not pre-arrange it, you will not be permitted to take the exam online.**

General information

Content covered. The topics on the midterm will be drawn from the required exercises on the homework from weeks 1-7 and 9-13 (there was no week 8 homework). If you understand all of these thoroughly, you should be successful on the exam.

Computations. I will try to choose numbers so that the computations can be done by hand in the allotted time if you understand the material. You may use a calculator (see template exam instructions for details), including for modular arithmetic, but you should show work where appropriate (for example, if the problem says “use the Euclidean algorithm to...”, then you had better write out the steps of the Euclidean algorithm, even if you use a calculator for some computations on the way!)

Anticipated outcome. Based on the level of difficulty of the exam, I anticipate that the median grade will be in the range of 80-85 percent. I will be delighted if it is better!

Grades availability. I will post grades for the final exam on Canvas a few days after the exam, as well as an answer key on the course website. Your graded written copy can be retrieved by appointment after grades are posted to Canvas.

Final Exam Template

Exam instructions. You have **two hours** to complete the exam. You may use any resource linked to from the class website, including the book and notes/whiteboards. You may also use your personal notes and your personal homeworks. You may use a calculator, including an online calculator or spreadsheet, to do computations, but you may not use a calculator that shows work (e.g., that carries out the Euclidean algorithm automatically and shows you the steps that it took). Your work should be your own, and you may not discuss the exam with anyone else until it is finished.

Exercise 0. Name and signed statement of academic integrity (10 points).

I certify that the work on this exam is my own, that I have not discussed any of the problems with my classmates or other people, and that I have followed the rules as explained in the exam instructions.

Name:

Signature:

Exercise 1. True or False (30 points)

No justification is required for your answer.

15 true or false questions, drawn from the topics covered in the required exercises from Weeks 1-7 and Weeks 9-13.

Exercise 2. The Euclidean algorithm (30 points)

Show your work – an answer alone will not receive credit.

Three parts – one each on carrying out the Euclidean algorithm in $\mathbb{Z}$, in $\mathbb{F}_p[x]$, and in $\mathbb{Z}[i]$.

Note: the problems may ask you just to carry out the Euclidean algorithm in a specific case, or to do something else that requires carrying out the Euclidean algorithm as its main step.

Similar to things in:

Week 2 - Exercise 1, Week 3 - Exercise 5, Week 4 - Exercise 4, Week 12 - Exercise 2

Exercise 3. Quadratic reciprocity and Legendre symbol (20 points)

Show your work – an answer alone will not receive credit.

Two parts

Similar to things in Week 9 - Exercise 3, Week 10 - Exercise 1 and 2, and/or Week 11 - Exercise 1

Exercise 4. Sums of two squares and Gaussian primes (10 points)

Show your work – an answer alone will not receive credit.

Similar to something in Week 12 - Exercise 1 or 2

Exercise 5. Pell's equations (10 points)

Show your work – an answer alone will not receive credit.

Similar to something in Week 13 - Exercise 1 or 2.