

**MATH 123 - ALGEBRA II**  
**INFORMATION ON THE LAST EXAM**

**When?** The last exam will be published right after the last class (around 10h30am) on Wednesday, April 29, 2020. You will have 51 hours to solve the problems. The exam will be due back on Friday, May 1, before 2pm (Eastern time). Please send it as a PDF to me by email (I will reply with a confirmation): `sebv@math.harvard.edu`.

If you cannot take the exam at that time, please let me know as soon as possible (`sebv@math.harvard.edu`).

**What is covered?** The last exam will cover everything discussed in class until and including Wednesday, April 22, as well as the material introduced in the assignments. For your convenience, the following lists the topics discussed, with corresponding chapters and sections in Dummit and Foote (3rd edition).

- Basic ring theory: sections 7.1-7.6 (except material related to integer rings and fields, matrix rings, and group rings).
- Basic theory of factorization in integral domains: chapter 8 (except computational results on integer rings, and the application to factorization in the Gaussian integers).
- Polynomial rings and irreducibility: sections 9.1-9.4 (but we did not discuss polynomials in several variables).
- Basic module theory: sections 10.1-10.3 (but we did not discuss  $R$ -algebras).
- The structure theorem for modules over PIDs: sections 12.1-12.3 (we did not discuss how to compute the matrix canonical forms).
- Basic theory of fields and algebraic extensions: sections 13.1-13.6.
- Basic Galois theory: sections 14.1, 14.2 (the computation of the subfields of the splitting field of  $x^8 - 2$  and corresponding subgroups was not discussed in details), 14.3 (we did not discuss using Möbius inversion to compute the number of irreducibles, nor the description of the algebraic closure of  $\mathbb{F}_p$ ), 14.4, 14.5 (we did not discuss the computations around  $\mathbb{Q}(\zeta_{13})$ ), 14.6 (we did not discuss the specific procedures on p. 611-615 to compute the

Galois group of a cubic and quartic), 14.7 (we did not discuss formulas for cubics and quartics).

**What can I use during the exam?** You may use material to write the exam (either scanner, pen and paper, a text editor with latex, or a word processor, etc.), as well as core course material, but not the whole internet.

In details, you may use your personal course notes, the course textbook (David S. Dummit and Richard M. Foote, *Abstract Algebra*, any edition you like), the slides and recordings of past lectures, Forrest's class notes, the assignments, sample exams, and their solutions posted on Canvas. You may *not* use any other documents. In particular, you are *not* allowed to search the web for solutions, go on Wikipedia, or consult any other textbook (*even* the ones listed under "other resources" on the course webpage). You may *not* use a calculator (it would be completely useless anyway) and you may *not* collaborate with anybody. You are *not* even allowed to show the exam to anybody (even if you have no plans to collaborate with them) before it is over.

**What will the exam look like?** The exam will have nine problems, and you will have to solve six of them. I will try to make these problems slightly easier than in your homework, but your answer will be expected to have the same level of details as in the homework.

**What can I do to prepare for the exam?** Make sure you understand all of the homework and the course material. A sample exam is available on the course website. I highly encourage you to try to solve it!

**Will there be an assignment due right before the exam?** No. The last assignment of the term will be assignment 11, due midnight on Friday April 27. I encourage you to still peer review this last assignment, although this will not be graded.