

Math 463/563 Algebra II Fall 2011 11:00 MWF HB 427

Professor John Hempel

Office: 418 HB, hours 10-11 am MWF, or call ext 5126 (713 348 5126) or email hempel@rice.edu for other arrangements.

Any student with a documented disability needing academic adjustments or accommodations is requested to speak with me during the first two weeks of class. All discussions will remain confidential. Students with disabilities should also contact Disability Support Services in Allen Center.

Text: *Algebra 2nd edition* by Michael Artin, Pearson (2010). The second edition is enough different from the first that I strongly recommend that you have access to it. In particular, homework problems, textual references, etc. will all be for the 2nd edition. It is available online through CourseSmart as well as in printed form through the book store. Depending on how you like to work, you may find the online version adequate— particularly if you already own a copy of the 1st edition

Topics: Basic Ring Theory: ideals, quotient rings, polynomial rings, factorization, UFDs, PIDs. Module Theory – including structure theorem for modules over a PID with applications to Advanced Linear Algebra (Jordan form, etc.). Quadratic and bilinear forms. Hom and dual spaces. Tensor and exterior algebras. Field Theory: algebraic and transcendental extensions, structure for finite fields, Galois Theory – including constructible numbers, solving equations by radicals, and Galois groups.

Grading:

- There will be a final exam and one or two mid-term exams – depending on class performance on the homework.
- Homework will count for 50% of the grade. It will be broken into two categories: routine and challenging (marked with a "star", e.g 5*). For students taking Math 463 the routine problems will count for $\frac{4}{5}$ of the 50% HW grade and the challenging problem the remaining $\frac{1}{5}$. For students taking Math 563 the break down will be $\frac{3}{5}$ routine and $\frac{2}{5}$ challenging.
- Homework is not pledged, but I encourage you to put as much of your own effort into it as possible. In particular, the composition and write up of homework must be your own work. Discussion of ideas, approaches,

etc. in general (with fellow students, me, the grader, etc.) is encouraged and for particular problems is better than getting hopelessly stuck.

- Good mathematical exposition will be counted on both exams and homework.
- Homework is due at the beginning of class on the due date.
- Students enrolled in Math 563 must produce at least half of their homework assignments with \TeX . This is a necessary (but not sufficient) condition for a grade of at least "B"

Owl Space: This course has an Owl Space site with links to this page. I will use Owl Space primarily for emailing announcements, and, if interest exists, organizing chat rooms, forums, etc.. However, this web page will be the official source for all information about the course.

Grader: Zhiyuan Li zhiyuan.li@rice.edu, Office HB 38.

Homework Assignments:

HW #1 Page 354: 1.1, 2*, 3, 8; 2.2*; 3.3, 7, 8, 11, 12, 13. Due Wed. 8/31.

HW #2 Page 355: 4.1, 3(a), (b), (c), 4; 5.1, 5, 6*; 6.2, 4, 5, 8*(In (b) show x is unique modulo $I \cap J$). Due Wed. 9/7.

HW #3 Page 357: 7.3, 5; 8.1*, 2(a)(c), 4; 9.2, 4, 10, 11*(add: f_1, f_2 polynomials in two variables). Due Wed. 9/14.

HW #4. Page 378: 1.2; 2.2, 4, 6*, 10*; 3.2, 4.5, 12(a)(b), 15*, 16. Due Wed. 9/21.

HW #5. Page 381: 5.1(a)(b)(c), 5, 6;. Page 408: 1.3* (you will need an extra assumption for one direction of part (c)), 4; 2.2*; 3.2(a)(c); 4.1; 5.1*. Due Wed. 9/28.

HW #6. Page 437: 1.3, 4; 2.3*, 4; 4.2, 6, 7; 5.1*, 2. Due Wed. 10/5.

HW #7. Page 439: 6.1, 2; 7.4, 5, 7, 8, 9*; 8.2*, 5. Due Fri. 10/14.

There will be a (timed) take home exam on Chapters 11 through 14. Pick up in class Wed. 10/26 return in class Fri. 10/28.

HW #8. Page 472: 1.2; 2.2; 3.2, 4, 6, 8, 9; 4.2*; 5.1, 2*, 3. Due Fri. 10/21.

HW #9. Page 473: 6.2; 7.5, 7, 13; 8.2; Page 505: 1.1(a)(b)(c); 2.2, 3; 3.1, 2. Due Wed. 11/2.

HW #10. Page 506: 4.1; 5.1(b)(c); 6.1, 2; 7.2, 5*, 6, 10; 8.1, 4*, 5*. Due Wed. 11/9.

I recommend [the article by Rothman](#) for insights into Galois and his work.

HW # 11. Page 508: 9.3, 5*(counts as 2 probs); 10.2, 5(b)(d), 9; Plus:

A. Show that a group G which contains a solvable normal subgroup N with G/N solvable is solvable.

B. Show that a group G which contains a non-abelian simple subgroup is not solvable.

C*. If $F \subset L \subset K$ is a sequence of field extensions with L Galois over F and K Galois over L must K be Galois over F ? Due Wed. 11/16.

HW # 12. Page 254: 2.2; 3.3, 4; 4.10, 11, 12, 21*; 5.3*, 4. Due Wed. 11/23.

HW # 13. Page 256: 6.1, 3, 11, 14, 19; 7.1; 8.1, 4*; M.1*. Due Fri. 12/2.

This page is maintained by John Hempel (hempel@rice.edu or [link to homepage](#)).
Last updated on 11/23/11.