

Math 463 Algebra II Fall 2009

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* by Michael Artin, Prentice-Hall (1991).

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.
- 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.

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: Crystal Li shuijing@rice.edu, Office: HB 47.

Homework Assignments:

#1. Pg. 379: 1.4, 6, 11, 12, 13; 2.6; 3.1, 7, 9, 11, 18. Due Mon. 8/31.

#2. Pg. 381: 3.19, 23, 28; 4.3, 7 (+ uniqueness mod $(I \cap J)$ in (b)); 5.5 (corrected to $1, \alpha, \alpha^2, \alpha^3$), 7, 14, 16. Due. Wed. 9/9.

For 3.19 and 3.23 you should assume p is prime. For 3.23 I suggest you first prove that $1 + p$ is a unit of R , and then show that the sub ring of R generated by a is finite – hence so its group of units.

#3. Pg. 384: 6.4, 5, 9; 7.2, 4, 7, 9, 11; 8.3, 4. Due Wed. 9/16

#4. Pg. 440: 1.9, 10, 15; 2.1, 2, 8, 9, 12; 3.2, 4. Due Wed. 9/23

#5. Pg. 443: 4.1, 3, 5 (assume $b, c \in \mathbb{Z}$), 10, 12, 14; 5.3, 5, 6; Plus: Determine, in terms of their prime factorization (in \mathbb{Z}), which integers are sums of two squares (of integers). Hint use $\mathbb{Z}[i]$. Due Wed 9/30.

#6. Pg 445: 6.1, 2, 3, 4, 6, 7*, 8 (in (a) should be: polynomial in $\mathbb{Z}[x]$); 7.3, 4, 8. Due Wed. 10/7

Take home exam. Pick up in class Wed. 10/14. Return in class Fri. 10/16.

#7. Pg.483: 1.5, 6, 7, 11, 12; 2.1, 2, 3, 4, 5. Due Wed. 10/21

#8. Pg. 485: 4.4, 9, 10; 5.4, 6, 8; 6.3(b)(e), 4, 7, 9. Due Wed. 10/28.

#9. Pg. 487: 7.2, 4, 6, 16, 18, 19; 8.1. Due Wed. 11/4

#10. Pg. 530: 1.3; 2.3, 5; 3.3, 6, 8, 11; 4.1, 3, 5, 6. Due Wed. 11/11

#11. Pg. 532: 5.3; 6.7, 13; Pg. 575: 1.4, 6, 10, 14, 18; 2.1, 4. Due Wed. 11/18

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

#12 Pg. 576: 3.3; 4.2, 3(c), (e); 5.1, 2, 3, 8, 9. (Note change) Due Wed. 11/25.

This page is maintained by John Hempel (hempel@rice.edu or, [link to homepage](#)).
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