Resources - Abstract Algebra II Spring 24

Homework is posted here: https://www.overleaf.com/read/tnfmgvfmqzwc
Group Tables: https://hobbes.la.asu.edu/groups/
Feedback Notes: Math 456 F23: Notes from Grading

Weekly Class Notes

Week 1:

Text sections: Chapter 5 & 6
Takeaways: Fundamental Theorem of Finite Abelian Groups

- Review of Semester 1 concepts
    - Element order (|g^b|=|g|/gcd(|g|,b), Lagrange's Theorem
    - Factor groups, properties of isomorphism and homomorphism, 1st & 4th isomorphism theorems
    - p-groups, Sylow p-subgroups, and Sylow's theorems
    - Inner and Outer Direct Products

Perusall: Syllabus by 11:30pm **Monday 1/22**
Homework 1: Turn in conversation recording and Problem 4 through WISE by 11:30pm **Friday 1/26**

Week 2:

Text sections: Chapter 5 & 6 & 7.1
Takeaways: Fundamental Theorem of Finite Abelian Groups, Introduction to Rings

- Takeaways of FTFAG, elementary divisor and invariant factor decompositions
- Definitions of rings, units, unity, zero divisors, integral domains, and fields
- Examples of rings

Perusall: Dummit & Foote 7.1 (due 11:30pm Monday 1/29)

Homework #2 (due Wednesday 1/31)

Week 3:

Text sections: 7.2 & 7.3
Takeaways:

- Polynomial Rings
- Ring homomorphism
- Factor Rings

Perusall: Unit Conjecture (due 11:30pm Monday 2/5)

Homework #3 (due Wednesday 2/7)

Week 4:

Text sections: 7.3 & 7.4
Takeaways:

- Ring homomorphism
- Factor Rings & Ideals
- Ring Isomorphism Theorems
- Principal Ideals

Perusall: Students Unravel Widely Believed Conjecture (due Monday 2/12)

Homework #4 (due Wednesday 2/14)

Week 5:

Text sections: 7.4 & 7.5
Takeaways:

- Prime and Maximal Ideals

Perusall:

Homework #5 (due Wednesday 2/21)

Week 9:

Text sections: Pinter Ch. 24-26
Takeaways:

- Domains of Polynomials over Fields F[x], Introduction and Properties
- Perspectives on Polynomials: Elements versus Functions on Fields
    - Connections between roots and factors
    - Fundamental Theorem of Algebra

Perusall: Pinter Ch. 24 (due **11:30pm Monday 3/11**)

Individual Celebration of Knowledge **Tuesday 3/12**: Study Guide

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Week 10:

Text sections: Pinter Ch. 26-27
Takeaways:

- Irreducibility tests in Q and Z
- Extension Fields

Homework #8 (due **Wednesday 3/20**)

Ooops! Sort of forgot about Class Notes after Spring Break

Week 15:

Text sections: Pinter Ch. 32-33
Takeaways:

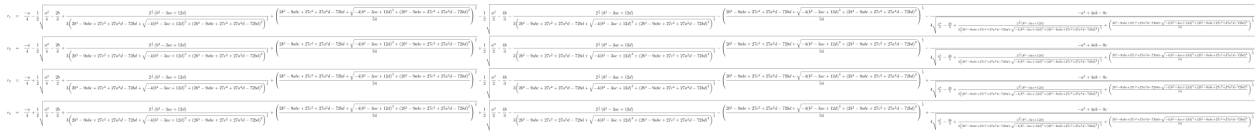
- Fundamental Theorem of Galois Theory
- Solvability

Solution to Quadratic: (you fill in)

Solution to Cubic:

$$
\begin{aligned}
x_1 = & -\frac{b}{3a} \\
& -\frac{1}{3a}\sqrt[3]{\frac{1}{2}\left[2b^3-9abc+27a^2d+\sqrt{\left(2b^3-9abc+27a^2d\right)^2-4\left(b^2-3ac\right)^3}\right]} \\
& -\frac{1}{3a}\sqrt[3]{\frac{1}{2}\left[2b^3-9abc+27a^2d-\sqrt{\left(2b^3-9abc+27a^2d\right)^2-4\left(b^2-3ac\right)^3}\right]} \\
x_2 = & -\frac{b}{3a} \\
& +\frac{1+i\sqrt{3}}{6a}\sqrt[3]{\frac{1}{2}\left[2b^3-9abc+27a^2d+\sqrt{\left(2b^3-9abc+27a^2d\right)^2-4\left(b^2-3ac\right)^3}\right]} \\
& +\frac{1-i\sqrt{3}}{6a}\sqrt[3]{\frac{1}{2}\left[2b^3-9abc+27a^2d-\sqrt{\left(2b^3-9abc+27a^2d\right)^2-4\left(b^2-3ac\right)^3}\right]} \\
x_3 = & -\frac{b}{3a} \\
& +\frac{1-i\sqrt{3}}{6a}\sqrt[3]{\frac{1}{2}\left[2b^3-9abc+27a^2d+\sqrt{\left(2b^3-9abc+27a^2d\right)^2-4\left(b^2-3ac\right)^3}\right]} \\
& +\frac{1+i\sqrt{3}}{6a}\sqrt[3]{\frac{1}{2}\left[2b^3-9abc+27a^2d-\sqrt{\left(2b^3-9abc+27a^2d\right)^2-4\left(b^2-3ac\right)^3}\right]}.
\end{aligned}
$$

Solution to Quartic:



Langlands Conjecture: https://en.wikipedia.org/wiki/Langlands_program

Homework #12 (due **Monday 4/29**)