MATH 4281 (002) Introduction to Modern Algebra (Spring 2023)

Jump to Today

Instructor: Tian-Jun Li, Vincent 260, 612-625-2036, **lixxx248@umn.edu. (mailto:lixxx248@umn.edu,)**

(mailto:lixxx248@umn.edu,)

Time and Location: Monday, Wednesday, Friday,11:15-12:05, Vincent 2.

Text book:

Abstract algebras with applications

Author: TERRAS, AUDREY

Publisher: CAMBRIDGE UNIVERSITY PRESS

--GRADING

There are three in class tests and three quizzes. No common final. The three in class tests are tentatively scheduled on the following Fridays:

February 24, April 7 and April 28.

Quizzes are given on the following Mondays:

Feb 20, April 3 and April 24.

There are six /seven homework assignments.

Each test accounts for %15, each quiz accounts for 5%, and homework account for %40 (the lowest score homework will be dropped).

Office hours: 10-11 on Mondays and 12:45-1:45 on Wednesdays in my office.

Course schedule:

1/18: Syllabus, Section 2.1 (definition of group, integer group Z, groups with one, two, three elements)

1/20: Sections 1.6 (congruence), 2.3 (Z_n--the group of integers mod n), 2.1 (the symmetric group S_n)

1/23: Sections 2.1 (Comparing C_n, D_n, S_n)

1/25: Sections 2.3 (Theorem 2.3.1--basic facts), 1.5 (Bezout identity about gcd), 2.3 (Z^*_n, Phi function)

1/27: Sections 2.4 (orders $|G|$ and $|a|$, $<a>$, subgroup), 2.5 (generators and subgroups of C_n)

1/30: Thms 2.5.1+2, subgroup tests (2.4.1+2+3), center, vector and matrix groups (Klein, general linear)

2/01: Section 3.1, S_n generated by cycles, Prop 3.1.1, even via (unique) disjoint cycle decomposition

2/03: Sections 3.1, 3.2, A_n, transpositions, sign, 3 definitions of even permutations, isomorphism

2/06: Sections 3.2, 3.3, Theorem 3.2.1, conjugation isomorphism, conjugate elements, coset gH, G/H

2/08: Sections 3.3, 3.4, Theorem 3.3.1, normal subgroup, quotient group G/H

2/10: Sections 3.5, 3.6, group homomorphism, 1st isomorphism theorem, direct sum

2/13: Commutator subgroup, summary of Sections 3.1-3.6

2/15: Examples of normal subgroups and group homomorphisms, Section 3.7, group action

2/17: Section 3.7, Orb(x) and equivalence class, Orb/Stab Theorem, Burnside Lemma

2/20: Applying Burnside Lemma, Quiz 1 (Chapter 2 and Sections 3.1-3.6)

2/22: The group of units Z^*_{pq} in Section 4.2

2/24: Test 1 (Chapter 2 and Sections 3.1-3.6)

2/27: Test 1 solutions, Convolution products in Section 4.3

3/01: Orthogonal groups in Section 4.3, Cauchy Theorem in Section 3.7

3/03: Cauchy Theorem in the Abelian case, Exercise 3.4.14, Fund theorem of Abelian groups

3/13: Complete proof of Cauchy Theorem, Exercise 3.6.12, groups of order 2p

3/15: Section 4.5: tools (including Sylow Theorems) and steps to classify finite groups

3/17: Section 5.2: Definition and elementary properties of Rings

3/20: Section 5.2/3: subrings, group of units, poly ring, zero divisor, integral domain

3/22: Section 5.4: Ideal, quotient ring, principal, maximal and prime ideals

3/24: Section 5.5: irreducible polynomials, division algorithms and consequences

3/27: Examples of principal, maximal and prime ideals, examples of irreducible polynomials.

3/29: Proof of Lemmas 5.4.1, 5.4.2, Corollaries 5.5.1-4, Prop 5.5.1

4/01: Section 6.1, Quiz 2

4/05: Section 6.1

4/7: Test 2

4/10: Section 5.6

4/12: Section 6.1

4/14: Section 6.2

4/17: Section 6.3

4/19: Section 6.4

4/21: Section 7.1

4/24: Quiz 3

Course Summary:

Date	Details	Due
Wed Feb 1, 2023	📝 **HW1 (https://canvas.umn.edu/courses/356440/assignments/3053493)**	due by 11:59pm
Wed Feb 15, 2023	📝 **HW2 (https://canvas.umn.edu/courses/356440/assignments/3067052)**	due by 11:59pm
	📝 **Quiz1 (Chapter 2, Sections**	

Mon Feb 20, 2023	[3.1-3.6)](https://canvas.umn.edu/courses/356440/assignments/3093199)	due by 11:59pm
Fri Feb 24, 2023	📝 [Test 1](https://canvas.umn.edu/courses/356440/assignments/3096979)	due by 11:59pm
Sat Mar 18, 2023	📝 [HW3](https://canvas.umn.edu/courses/356440/assignments/3069841)	due by 11:59pm
Fri Mar 31, 2023	📝 [HW 4](https://canvas.umn.edu/courses/356440/assignments/3107543)	due by 11:59pm
Mon Apr 3, 2023	📝 [Quiz2 (Sections 3.7, 4.5, 5.1-5.5)](https://canvas.umn.edu/courses/356440/assignments/3125196)	due by 11:59pm
Fri Apr 7, 2023	📝 [Test 2](https://canvas.umn.edu/courses/356440/assignments/3130731)	due by 11:59pm
Fri Apr 21, 2023	📝 [HW 5](https://canvas.umn.edu/courses/356440/assignments/3113246)	due by 11:59pm
Mon Apr 24, 2023	📝 [Quiz3 (Section 5.6 and Chapter 6)](https://canvas.umn.edu/courses/356440/assignments/3143125)	due by 11:59pm
Fri Apr 28, 2023	📝 [Test 3](https://canvas.umn.edu/courses/356440/assignments/3148374)	due by 11:59pm