

MOUNT SAINT MARY COLLEGE
Newburgh, New York 12550

MTH 4050
Modern Abstract Algebra

Sr. Pat Sullivan
Spring, 2008

TEXT: *Contemporary Abstract Algebra*, Gallian 6th ed. 2006.

LEARNING OUTCOMES

By the end of the course, students should be able to:

- State the definition of a binary operation on a set, and give examples.
- State the axioms of a group, and verify that a given system is a group.
- Define, construct examples of and explore properties of groups, including symmetry groups, permutation groups and cyclic groups.
- Understand and give examples of of a subgroup and be able to check if a system is a subgroup.
- Define the symmetric group of degree n and be able to carry out computations involving permutations.
- Define what is meant by a homomorphism, kernel and image.
- Prove the main properties of a group homomorphism.
- Understand the notion of (right, left) cosets and compute cosets.
- Prove Lagranges's Theorem.
- Understand and give examples of a normal subgroup, and verify that a given subset of a group is a normal subgroup.
- Prove Cayley's Theorem
- Define and construct examples of rings.
- Communicate mathematical ideas in written and oral form.
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PREREQUISITE: MTH 253 and MTH 306

GRADE BASED ON:

1. Homework Assignments 20% (those collected)
2. Tests 60%
3. Essay 20 %

Homework (20%)

These will be assigned each class. A few randomly selected problems will be selected and graded. A rubric for grading proofs is attached to this syllabus. All work submitted must be your own. At the same time you are encouraged to discuss problems and general ideas with each other. Mathematics need not be an isolated activity. What you may not do is copy someone else's work.

Essay (20%)

You will submit an essay on how this course relates to what you will be teaching.

This must be a well thought out and clearly written document. Your ideas should be substantiated by creative lessons or activities that you might use in your teaching.

Reflection on how this course will impact the ways you teach the topics you choose should be included .

Important reminder: late assignments will not be graded and will receive an F grade.

ATTENDANCE:

A written attendance record will be kept. Regular attendance and active participation in the work of the class is essential. Lateness is not acceptable and will be documented.

There are no make-up exams without serious cause. Notes from health services do not constitute a medical excuse.

OFFICE HOURS:

T,Th ; 1:30-2:30
or by appointment
or by chance

Aquinas Hall Rm 50
Telephone 3267
e-mail sullivan@msmc.edu

GRADING SYSTEM:

<u>Grading</u>		<u>Quality Points</u>
93-100	A	4.0
88-92	A-	3.67
85-87	B+	3.33
82-84	B	3.0
78-81	B-	2.67
75-77	C+	2.33
72-74	C	2.0
68-71	C-	1.67
65-67	D+	1.33
60-64	D	1.0
Below 60	F	0

ACADEMIC HONESTY:

Ethics are an integral part of being a student and a professional. If a student breaches academic honesty, the student will receive an F for the work in which the breach appears. The following illustrate three possible forms of academic honesty:

Plagiarism, e.g. the submission without documentation of work that is not one's own or for which other credit has been obtained, improper collaboration in group work, copying or using unauthorized aids, tests, and examinations

COURSE OUTLINE

<u>Class Date</u>	<u>Topic</u>
1/22	Introduction to Groups
1/24	Definitions, examples and properties of groups
1/29	Finite Groups
1/31	Subgroup and subgroup tests
2/5	Proof work session
2/7	Cyclic groups
2/12	Classification of subgroups of cyclic groups cyclic
2/14	Review
2/19	Test#1
2/21	Permutation groups
2/26	Properties of permutation groups
2/28	Isomorphisms
3/4	Proof work session
3/6	Cayle's Thm
3/11	Cosets and lagrange's Thm.
3/13	External direct product
3/25	Properties of external direct product
3/27	Review
4/1	Test # 2
4/3	Normal subgroups
4/8	Factor groups
4/10	Group homomorphism
4/15	Proof work session
4/17	Introduction to rings
4/22	Subrings
4/24	Review
4/29	Test # 3
5/1	make up
5/6	summary

Rubric for Grading Proofs in Abstract Algebra

Statement of the Problem (5 points)

0-2	3-4	5
Incorrect statement of problem. May miss half of “if and only if” or misinterpret what is given or what is to be proven. May just recopy problem rather than give a precise restatement.	Correct but incomplete statement of the problem. Doesn’t include a statement of either the given or what is to be proven.	Correct statement with the given and what is to be proven stated in terms of the diagram.

Correctness of Proof (15 points)

0-1	2-5	6-9	10-14	15
Mainly incorrect consequences improperly deduced from the given. Little or no sense of how to prove the result.	Unconnected, mostly true statements properly deduced from the given. Listing facts without a sense of how to link them to get a correct proof. May just jump to the conclusion without justification.	Statements linked into a reasonable (though perhaps misguided) attempt to prove the theorem. The proof may be left incomplete or may depend upon a major unjustified leap.	A correct approach to proving the theorem is attempted. Some statements may be unjustified or improperly justified, but errors are minor and could be fixed easily.	A correct and complete proof is given.