

CONTEMPORARY ABSTRACT ALGEBRA



Part 2 Groups page 27-56

Definitions of **Binary Operation** , **Group**, Examples 1,2,3,4,5,6,7,8,9,11,12,13,19, Table 2.1, Elementary Properties of Groups: Theorem 2.1 (**Uniqueness of the identity**) with proof, Theorem 2.2 (**Cancellation**) with proof, Theorem 2.3 (**Uniqueness of Inverses**) with proof, Table 2.2, Theorem 2.4 (**Socks-Shoes Property**) with proof.

Computer Exercises at <http://www.d.umn.edu/~jgallian>

Exercises pages 52-55: 1,3,5,7,16,17,18,19,26

Part 3 Finite Groups; Subgroups page 57-71

Definitions **order of a group**, **order of an element**, Examples 1, 2,3, Definition of **Subgroup**, Theorem 3.1 (**One-step Subgroup Test**) with proof, Examples 4,5, Theorem 3.2 (**Two-Step Subgroups Test**) with proof, Example 6, Theorem 3.3 (**Finite Subgroup Test**) with proof, Examples of Subgroups (**Definition of Cyclic group**), Theorem 3.4 ($\langle a \rangle$ is a subgroup) with proof, Example 7,8,9, Definition **center of a group** , Theorem 3.5 (**Center is a subgroup**) with proof, Definition **Centralizer of a in G**, Theorem 3.6 ($C(a)$ is a subgroup) with proof, **Examples 10,11,12 (small project for students)**.

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Exercises pages 64-65: 1,2,3,5,7,19,23,27,28,46,49,51,53,55

Part 4 Cyclic Groups pages 72-94

Properties of a Cyclic Groups, Examples 1, 2,3,4, Theorem 4.1 Criterion for $a^i = a^j$ With proof, Corollaries 1, 2 , Theorem 4.2 $\langle a^k \rangle = \langle a^{\gcd(n,k)} \rangle$ without proof, Corollaries 1,2,3,4 without proofs. **Classification of Subgroups of Cyclic Groups** , Theorem 4.3 (**Fundamental Theorem of Cyclic Groups**) without proof, Example 5, Theorem 4.4 (Number of Elements of Each Order in a Cyclic Groups) without proof.

Exercises pages 81-88: 1,3,5,8,9,21,32,34,62

Part 5 Permutation Groups pages 95-120

Definitions **Permutation of A**, **Permutation Group of A**, Example 1 (**Symmetric Groups S_3**), Example 2 (**Symmetric Groups S_n**) Example 3 (**Symmetries of a square**), Cycle Notation, Properties of Permutations, Theorem 5.1 (Products of Disjoint Cycles) without proof, Theorem 5.2 (Disjoint Cycles Commute) without proof, Theorem 5.3 (Order of Permutation) without proof, Theorem 5.4 (Product of 2-Cycles), without proof, Examples 5,6, Lemma without proof, Theorem 5.5 (Always Even or Always Odd) without proof, Definition **Even and odd Permutations** , Theorem 5.6 (**Even Permutations Form a Group**) with proof, Definition **Alternating Group of Degree n**, Theorem 5.7 with proof . **Example 7 (small project for students)**

Exercises pages 113-120: 1, 2,3,4,6,9,17,18,21,25,26

Part 7 Cosets and Lagrange's Theorem pages 138-143

Definition **coset of H in G** , Examples 1,3, Lemma (**Properties of cosets**) with proof, Example 4, Theorem 7.1 (**Lagrange's Theorem**) with proof, Corollaries 1,2,3,4,5 with proofs, Example 5 (**The Converse of Lagrange's Theorem is False**).

Exercises pages 149-153: 1,2,3,57,13,27,31

Part 9 Normal Subgroups and Factor Groups 178-181

Definition **Normal Subgroup**, Theorem 9.1 (**Normal Subgroup Test**) with proof, Examples 1,2,3, Theorem 9.2 (**Factor Groups**) with proof, Examples 7,8, **Example 10 (small project for students)**.

Exercises pages 193-195: 1,2,4,7,12,13,14,17,21,55,56,57,60

Part 6 Isomorphisms pages 122 – 136

Definitions **Group Isomorphism**, **Homomorphisms**, Table 6.1, Examples 1,2,3,4, Theorem 6.1 (**Cayley's Theorem**) with proof, Theorem 6.2 (**Properties of Isomorphisms Acting on Elements**) some of them with proofs, Theorem 6.3 (**Properties of Isomorphisms Acting on a Groups**) some of them with proofs, Definition **Automorphism** , Theorem 6.4 (**Aut(G) is a group**) the proof is left as an exercise.

Exercises pages 133 – 136: 1, 2,3,4,5

Part 10 Group Homomorphisms 200-211

Definitions **Group Homomorphism** , **Kernel of a Homomorphism**, examples, 3,5,6,7, Properties of Homomorphisms, Theorem 10.1 (**Properties of Elements Under Homomorphisms**) with proofs, Theorem 10.2 (**Properties of Subgroups Under Homomorphisms**) with proofs, Corollary (Kernels Are Normal), Examples 9,11, Theorem 10.3 (First Homomorphism Theorem) with proof, Exercise 39 page 214 (**Second Isomorphism Theorem**) with proof, Exercise 40 page 214 (**Third Isomorphism Theorem**) with proof. Theorem 10.4 (**Normal Subgroups Are Kernels**) with proof

Exercises pages 211 - 215: 1, 3, 5,8,24,39,40,49

