

MATH 1530 ABSTRACT ALGEBRA
PROBLEM SET 3, DUE THURSDAY FEBRUARY 16 1PM IN CLASS

1. Dummit and Foote Problems 1a, 4, 9 on page 27–28. For problem 9, you may appeal freely to your geometric intuition.
2. Write out the full multiplication table for the group S_3 .
It should be a 6×6 table whose entries are elements of S_3 , and whose rows and columns are indexed by the elements of S_3 . Please write all elements using cycle notation.
3. Is it true that for all $n \geq 1$, every element of S_n has order at most n ? Either prove it, or give a counterexample.
4. Dummit and Foote problems 4, 6 on page 40.
5. Let $(G, *)$ and (H, \circ) be groups, and let $\phi: G \rightarrow H$ be an isomorphism. Let $\phi^{-1}: H \rightarrow G$ denote the *inverse* of ϕ . In other words, $\phi^{-1}(h) = g$ whenever $\phi(g) = h$.
Prove that ϕ^{-1} is also an isomorphism.
6. Prove that isomorphism is an equivalence relation on groups.