Homework 4

MATH 301/601

Due Wednesday, February 28, 2024

Instructions. *Read the appropriate homework guide (Homework Guide for 301 or Homework Guide for 601) to make sure you understand how to successfully complete the assignment. All claims must be sufficiently justified.*

Exercise 1. Complete the following exercises from #1 from Section 3.5 in the course textbook: # 2, 7, 10, 15, 25, 26, ***27, *31, *32**, 33

(# For 25 and 27, use induction.)

Exercise 2. Let D_4 denote the group of symmetries of a square.

(a) Describe all the elements of D_4. (You do not need to prove you have them all, but do your best. We will do an official count in class at a later date.)

(b) Describe a permutation of the vertices of the square that cannot be obtained via a symmetry of the square. (You will need to use the Pythagorean theorem: $a^2 + b^2 = c^2$, where a and b are the lengths of the legs of a right triangle and c is the length of the hypotenuse.)

****Exercise 3.** Let G be a finite group. Prove that there exists $N \in \mathbb{N}$ such that $g^N = e$ for each $g \in G$.