

Math 321 Fall 2016
Homework 5
Due: September 30, 2016

You are welcome to work together but everyone needs to write up **distinct** solutions. If you use any books outside of our textbook or other people, please make sure to give them credit. Make sure your solutions are complete. If your handwriting is atrocious, I am happy to give you a basic introduction to L^AT_EX.

1. #9.3
2. #9.12
3. #9.14
4. (8 points) (a) #4.4
(b) What is the order of 17 in $U(30)$?
(c) Find a cyclic subgroup of order 4 in $U(40)$ and find a noncyclic subgroup of order 4 in $U(40)$. (Don't forget to explain why.)
5. #5.30
6. Let n and a be positive integers. Prove that the equation $\bar{a} \cdot \bar{x} = \bar{1}$ has a solution \bar{x} if and only if $\gcd(a, n) = 1$.
7. # 9.5 (For Q_8 , $-I$ in the book is what I call -1 and J is what I call i .)
8. # 9.6 (For dihedral groups, in the book f is what I call r and g is what I call s .)
9. Let $G = S_4$ and let $H = \{e, (1\ 2), (3\ 4), (1\ 2)(3\ 4)\}$. Compute the right and left cosets decompositions determined by H . (Hint: Be as efficient as you can be. The cosets come from an equivalence relation that partitions the set.)