Math 417 – Test 2 – Material for review. 3/29/19

1. Exam = Wed 4/3/19 in class. Closed book/notes, except for 3"×5" card. Material is class lectures, Fraleigh §9, 10, 11, 13, 14. and homeworks 4, 5, 6, 7

2. Vocabulary – All previous group vocabulary, plus cycles, transpositions, left and right cosets of a subgroup, normal subgroups, homomorphism, isomorphism, automorphism, kernel, image, direct product of groups, The order of an element in a group, the order of a group

3. Notations – All previous notation

e.g. $\pi:\{1,2,3,4\}\to\{1,2,3,4\}$ Then This can be recorded as $\pi: 1\to 2\to 4\to 1,\ 3\to 3$ $\pi=\begin{pmatrix}1&2&3&4\\2&4&3&1\end{pmatrix}$

$\pi(1)=2,\ \pi(2)=4$

$\pi(3)=3,\ \pi(4)=1$ $\pi=(124)(3),\ \pi=(124)$

If H is a subgroup of G, $H\le G$, if H is a normal subgp. $H\trianglelefteq G$.

If $H\trianglelefteq G$, The cosets of H in G form the factor group G/H.

If $\varphi: G\to H$ is a homomorphism, know $\ker(\varphi)=\{x\in G:\varphi(x)=e_H\}$

and $\operatorname{im}(\varphi)=\{y\in H : \exists x\in G \text{ with } \varphi(x)=y\}$. "is isomorphic to".

4. Groups to know: C_n, V, S_3, D_4, $C_m\times C_n \cong (\mathbb{Z}/m\mathbb{Z})\times(\mathbb{Z}/n\mathbb{Z})$.

If you know ~~G~~ and H, you should know $G\times H$, etc.

5 Results to know: Lagrange's Theorem. If $H\trianglelefteq G$ is normal Then G/H is a group. If $\varphi: G\to H$ is a homomorphism, Then $\ker(\varphi)$ is a normal subgroup of G, and $\operatorname{im}(\varphi)$ is a subgroup of H That is isomorphic to $G/\ker(\varphi)$. Know how to compute The order of elements in C_n, S_3, D_4, etc and in direct products

6. Not on the test: Odd/even permutations, Cayley's Theorem, The book Theorem on classifying finite Abelian groups and, by popular request, non Euclidean geometry