September 16, hour 3 - Non Commutative Gaussian Elimination, Homomorphisms, Kernels and Images

September-15-10
6:53 PM

1. Finish tracing the NCGE handout; along do the S_4 example. done line.
2. Go over the "about" handout.
3. Group homomorphisms, the "category" of groups, images and kernels. Example: S_3 is an image of S_4, but not a kernel.
4. Normal subgroups, kernels are normal.
5. Question: Is there a normal subgroup of S_4 which is isomorphic to S_3?

Example $\sigma_1 = (123) = 2314$ $\sigma_2 = (12)(34) = 2143$, in S_4

11 I			
12 $\sigma_1 = 2314$ (1)	22 I		
13 $\sigma_{12}^2 = 3124$ (2)	23 $\sigma_{12}^{-1}\sigma_2 = 1342$ (3)	33 I	
14 $\sigma_{23}\sigma_{13} = 4132$ (5)	24 $\sigma_{13}^{-1}\sigma_{23}\sigma_{12} = 1423$ (4)	34	44 I

Feed $\sigma_1 = 2314$ ... Fed @ σ_{12}

Feed $\sigma_{12}^2 = 3124$ ... Fed @ σ_{13}

Feed $\sigma_2 = 2143$ ... Feed $\sigma_{12}^{-1}\sigma_2 = 1342$ .. Fed @ σ_{23}

Feed $\sigma_{12}\sigma_{23} = 2143$ ... Feed $\sigma_{12}^{-1}\sigma_{12}\sigma_{23} = \sigma_{23}$ ....

No point feeding $\sigma_{ij}\sigma_{kl}$ if $i<k$?

Feed $\sigma_{23}\sigma_{12} = 3412$ ... Feed $\sigma_{13}^{-1}\sigma_{23}\sigma_{12} = 1423$ ... to σ_{24}

Feed $\sigma_{23}\sigma_{13} = 4132$ .. to σ_{14}

Feed $\sigma_{24}\sigma_{12} = 4213$ ... Feed $\sigma_{14}^{-1}\sigma_{24}\sigma_{12} = 1423$ ... drop.

$\Rightarrow |G| \geq 4 \cdot 3 \cdot 1 \cdot 1 = 12$. Is $4123 \in G$?

Write 2431 in terms of $\sigma_{1,2}$.