

September 15, 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.
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?

Announce Selick!

not done

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

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

on board (mimms) fills

Feed  $\sigma_1 = 2314 \dots$  Feed @  $\sigma_{12}$

Feed  $\sigma_{12}^2 = 3124 \dots$  Feed @  $\sigma_{13}$

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

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

No point feeding  $\sigma_i; \sigma_{kl}$  if  $k < i$

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

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

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

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

write  $2431$  in terms of  $\sigma_{12}$ .