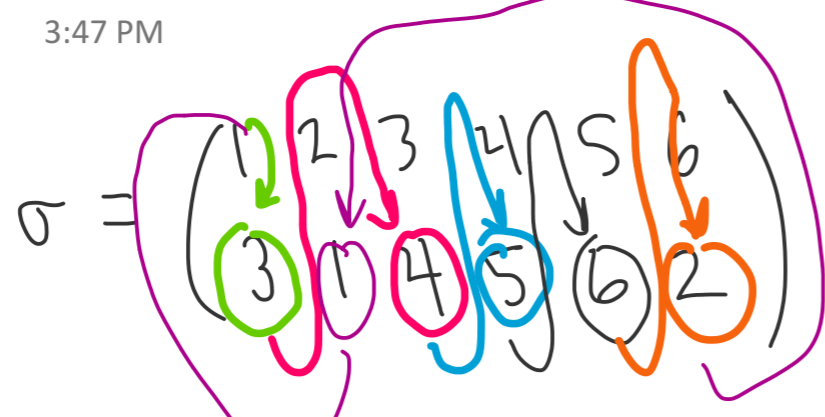
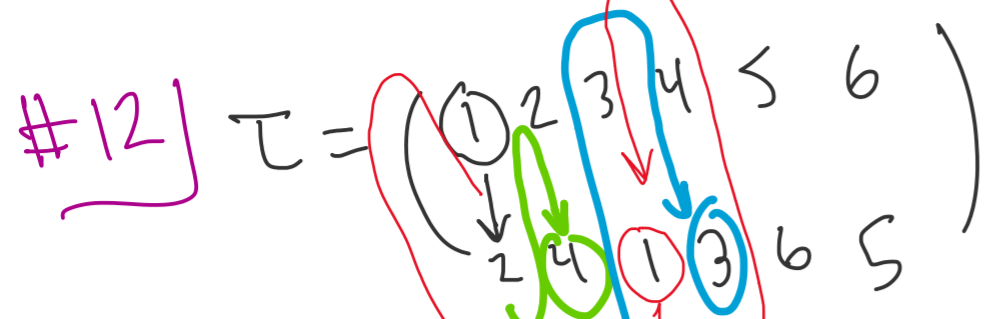


pg. 83 #11



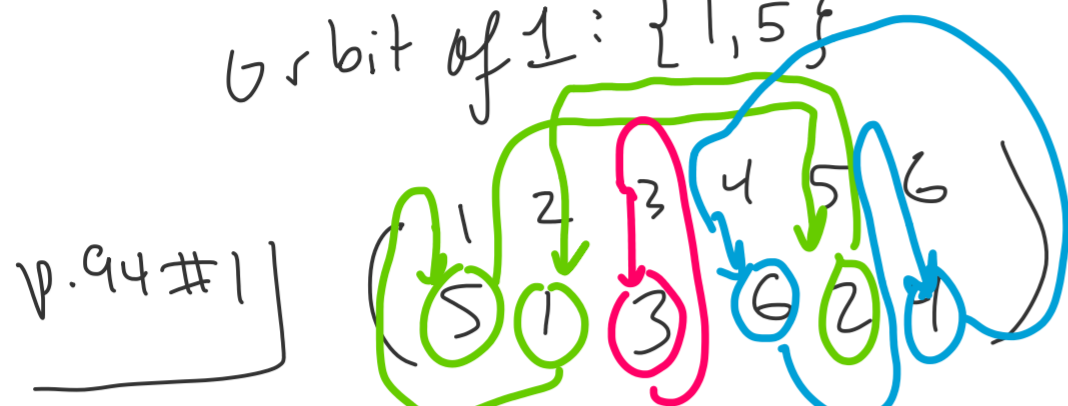
Orbit of 1:  $\{1, 3, 4, 5, 6, 2\}$



orbit of 1:  $\{1, 2, 4, 3\}$

#13  $\mu = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 5 & 2 & 4 & 3 & 1 & 6 \end{pmatrix}$

Orbit of 1:  $\{1, 5\}$



Orbit of 1:  $\{1, 5, 2\}$

Orbit of 3:  $\{3\}$

Orbit of 4:  $\{4, 6\}$

all numbers accounted for

#3  $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 2 & 3 & 5 & 1 & 4 & 6 & 8 & 7 \end{pmatrix}$

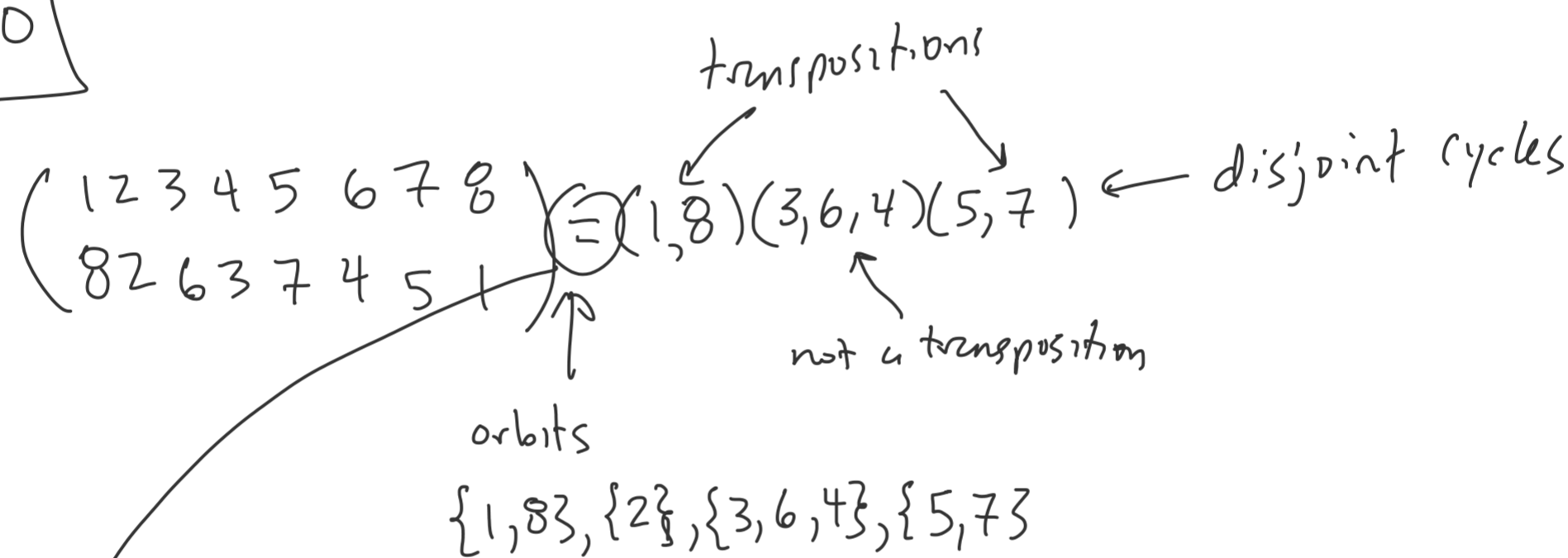
orbit of 1:  $\{1, 2, 3, 5, 4\}$

orbit of 6:  $\{6\}$

orbit of 7:  $\{7, 8\}$

#7  $(1, 4, 5)(7, 8)(2, 5, 7) = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 4 & 2 & 3 & 5 & 1 & 6 & 7 & 8 \end{pmatrix} \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 1 & 2 & 3 & 4 & 5 & 6 & 8 & 7 \end{pmatrix} \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 1 & 5 & 3 & 4 & 7 & 6 & 2 & 8 \end{pmatrix}$   
 $= \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 4 & 1 & 3 & 5 & 8 & 6 & 2 & 7 \end{pmatrix}$

#10



orbits  $\{1, 8\}, \{2\}, \{3, 6, 4\}, \{5, 7\}$

Write  $(3, 6, 4)$  as transpositions:  $(3, 4)(3, 6)$

So  $\gamma = (1, 8)(3, 4)(3, 6)(5, 7)$

#31 A infinite.  $H = \{\sigma \in S_A : \sigma \text{ moves at most finitely many elts}\}$

Is H a subgroup of  $S_A$ ?

Yes: ① if  $\sigma, \tau \in H$ , then  $\sigma\tau \in H$  since it can only move finitely many elts since that's what  $\sigma$  and  $\tau$  do  $\Rightarrow$  closed under op

② identity permutation moves 0 elts, which is finite, so the identity permutation is in H  $\Rightarrow$  contains identity

③ inverse of a permutation that moves only finitely many elts would move those finitely many elts back  $\Rightarrow$  closed under inverses

p. 101

#1) cosets of  $4\mathbb{Z}$  in  $\mathbb{Z}$ :

all the cosets  $\begin{cases} 4\mathbb{Z} = \{\dots, -8, -4, 0, 4, 8, \dots\} \\ 1(4\mathbb{Z}) = \{\dots, -7, -3, 1, 5, 9, \dots\} \\ 2(4\mathbb{Z}) = \{\dots, -6, -2, 2, 6, 10, \dots\} \\ 3(4\mathbb{Z}) = \{\dots, -5, -1, 3, 7, 11, \dots\} \\ 4(4\mathbb{Z}) = \{\dots, -4, 0, 4, 8, 12, \dots\} \end{cases}$  same

#2) cosets of  $4\mathbb{Z}$  in  $2\mathbb{Z}$

all the cosets  $\begin{cases} 4\mathbb{Z} = \{\dots, -8, -4, 0, 4, 8, \dots\} \\ 2(4\mathbb{Z}) = \{\dots, -6, -2, 2, 6, 10, \dots\} \\ 4(4\mathbb{Z}) = \{\dots, -4, 0, 4, 8, 12, \dots\} \end{cases}$  same

#3) cosets of  $\langle 2 \rangle$  in  $\mathbb{Z}_{12}$

all the cosets  $\begin{cases} \langle 2 \rangle = \{2, 4, 6, 8, 10, 0\} \\ 1\langle 2 \rangle = \{3, 5, 7, 9, 11, 1\} \\ 2\langle 2 \rangle = \{4, 6, 8, 10, 0, 2\} \end{cases}$  same