5. TRUE or FALSE. (If true, PROVE it. If false, give a COUNTER EXAMPLE.)
   If A is a finite set and b is an element of A, then

$$T = \{\sigma \in S_A \mid \sigma(b) = b\}$$

   is a group.

True

Closure   Take $\sigma, \tau \in T$ $\sigma \circ \tau (b) = \sigma(b) = b$ ∴ $\sigma \circ \tau \in T$

inverses   If $\sigma \in T$ then $\sigma(b) = b$ So $\sigma^{-1}(\sigma b) = \sigma^{-1}(b)$

                                          So $b = \sigma^{-1}(b)$

   Thus $\sigma^{-1} \in T$

T is not empty because $id \in T$

6. TRUE or FALSE. (If true, PROVE it. If false, give a COUNTER EXAMPLE.)
   If A is a finite set, B is a subset of A, and b is an element of B, then

$$T = \{\sigma \in S_A \mid \sigma(b) \in B\}$$

   is a group.

False   Take $A = \{1,2,3\}$ $B = \{1,2\}$ $b=1$

   the permutation $\sigma = (123)$ is in   since $\sigma(1) = 2 \in B$

   but $\sigma^2 = (132) \notin T$ because $\sigma^2(1) = 3 \notin B$

Thus T is not closed.