

Name: \_\_\_\_\_

**Reading Questions**

1. Make sure you know the definitions of conjugation, conjugacy classes, and centralizer subgroups and the statement of the class equation.
2. A group  $G$  acts on *itself* by conjugation: for  $g, x \in G$ ,  $(g, x) \mapsto gxg^{-1}$ .
  - (a) What is the set of all elements in  $G$  fixed by every element of  $G$ , namely  $\{x \in G : gxg^{-1} = x \text{ for all } g \in G\}$  called? (This is a subgroup of  $G$  with a specific name.)
  - (b) For  $x \in G$  *not* fixed by every  $g \in G$ , what is the orbit of  $x$  under  $G$  called?
  - (c) For each  $x$  in  $G$ , what is the stabilizer of  $x$  in  $G$  called? (This is also a subgroup of  $G$  with a specific name.)
3. Reread Example 8, verifying the details for yourself. You could use the fact that  $S_3 = D_3 = \{\text{id}, r, r^2, s, sr, sr^2\}$  if you prefer this to cycle notation. In particular,
  - (a) What is the center of  $S_3$ ?
  - (b) What are the conjugacy classes of  $S_3$ ?

- (c) Pick a representative  $x_i$  for each nontrivial conjugacy class, find the centralizer  $C(x_i)$ , and find the index of  $C(x_i)$  in  $G$ .

- (d) Verify that the class equation holds in this example.

4. What struck you in this reading? What is still unclear? What remaining questions do you have?