The proof of the Zassenhaus Lemma (p. 279), and hence the Jordan-Hölder Theorem, relies on the certain facts unproved in the text. Rotman defines a map of sets

\[ \phi : A(A^* \cap B^*) \rightarrow \frac{A^* \cap B^*}{(A \cap B^*)(A^* \cap B)} \]

by \( ax \mapsto xD \), where \( a \in A \) and \( x \in A^* \cap B^* \). Show that (i) \( \phi \) is a group homomorphism, (ii) \( \phi \) is surjective, and (iii) \( \text{Ker } \phi = A(A^* \cap B) \).

Do nine of the following ten problems from the text: 5.18, 5.33, 5.34, 5.37, 5.39, 5.40, 5.41, 5.42, 5.45, 5.49.

The set is due Tuesday, November 19 at 3:30 pm in Pierre Albin’s mailbox.

Date: Tuesday, November 12, 2002.