1. Let $H$ be a subgroup of $G$.
   
   (a) Let $C(H) = \{x \in G : xh = hx \text{ for all } x \in H\}$. Show that $C(H)$ is a subgroup of $G$.
   
   (b) Let $G = D_n$ and $H = \{r^i : 0 \leq i \leq n - 1\}$. What is $C(H)$?
2. Suppose $G$ is a group, $a, b \in G$ and $ab = ba$. Furthermore, let $m = |a|$ and $n = |b|$. If $\langle a \rangle \cap \langle b \rangle = \{e\}$, show that $G$ has an element of order $lcm(m, n)$. 
3. Required for the grads and extra credit for the undergrads.
   Let $G$ be a group and $x \in G$ and $n = |x|$. Find a necessary and a sufficient condition on $r$ and $s$ so that $< x^r > \subseteq < x^s >$. 