Homework due Friday, March 1, 3:00 pm.

(1) (a) List all the elements of the group $A_4$.
    (b) List all the elements in $A_4 \cap D_4$.

(2) Let $\sigma = (1234)(567)$ be an element in $S_8$. Find the order of $\sigma$.

(3) Show that $S_5$ is generated by the following list of transpositions.
    $\{(1, 2), (2, 3), (3, 4), (4, 5)\}$.

(4) (a) Let $\sigma_1 = (123)(4567)$ and $\sigma_2 = (1256)(347)$ be two permutations in $S_9$. Find a permutation $\tau$ so that $\sigma_1 = \tau \sigma_2 \tau^{-1}$.
    (b) (Bonus problem) Let $\sigma, \tau \in S_n$. Further, assume that $\sigma = (i_1, i_2, \ldots, i_\ell)$ is a cycle of length $\ell$. Show that
        $\tau \sigma \tau^{-1} = (\tau(i_1), \tau(i_2), \ldots, \tau(i_\ell))$.
        In particular, $\tau \sigma \tau^{-1}$ is also a cycle of length $\ell$.

(5) Exercise 9 page 94: 2, 9, 13

(6) Exercise 10 page 101: 3, 6, 15, 28, 29, 36, 39