1. Let \( \sigma \in S_n \) be the permutation given by \( \sigma(i) = n - i + 1 \), for \( i \in \{1, \ldots, n\} \).
Find the cycle decomposition of \( \sigma \).

2. At the top of page 24 in the book, elements of \( D_{2n} \) are defined as permutations of the set \( \{1, 2, \ldots, n\} \). In other words, \( D_{2n} \) is a subset of \( S_n \). Find the cycle decompositions of \( r, s, rs, \) and \( r^2 \), when these are viewed as elements of \( S_n \). [Hint: the answer may look different for even and odd \( n \).]

3. Let \( \sigma \in S_n \). In class (9/26), we defined the support as
\[
\text{Supp}(\sigma) = \{i \in \{1, \ldots, n\} | \sigma(i) \neq i\}.
\]
(a) Prove that \( \text{Supp}(\sigma\tau) \subseteq \text{Supp}(\sigma) \cup \text{Supp}(\tau) \) for any \( \sigma, \tau \in S_n \).
(b) Is it always true that \( \text{Supp}(\sigma\tau) = \text{Supp}(\tau\sigma) \)? [Hint: the answer is “no”.]