Recall:

1. Every permutation can be written as a cycle or as a product of disjoint cycles. (Thm 5.1)
2. Disjoint cycles commute. (Thm 5.2)
3. Every permutation can be written as a product of (not necessarily disjoint) transpositions. (Thm 5.4)

Lemma: If $\epsilon = \beta_1\beta_2\cdots\beta_r$ where the β_i's are 2-cycles, then r is even.

Theorem 5.5: If a permutation α can be expressed as the product of an even number of transpositions, then every decomposition of α must have an even number of transpositions. The same is true for a decomposition into an odd number of transpositions.

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