Applied Algebra

Instructions   Please write your name in the upper right-hand corner of the page. Use complete sentences, along with any necessary supporting calculations, to answer the following questions.

1. Consider the quaternion group $\{1, -1, i, -i, j, -j, k, -k\}$. Determine all the distinct (left) cosets of the subgroup $\{1, -1, i, -i\}$.

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2. Let $S(5)$ be the symmetric group [consisting of all permutations of the set $\{1, 2, 3, 4, 5\}$], and let H be the cyclic subgroup generated by the permutation (1 2)(3 4 5) [this permutation is written in cycle notation as the product of two disjoint cycles]. How many distinct (left) cosets does the subgroup H have in $S(5)$?