Let S be the set of all words consisting of the letters x, y, z, and consider an equivalence relation $\sim$ on S satisfying the following conditions: for arbitrary words $u, v, w \in S$

(i) $uu \sim u$;

(ii) if $v \sim w$ then $uv \sim uw$ and $vu \sim wu$.

Show that every word in S is equivalent to a word of length at most 8.