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Alexander Yu. Olshanskiy* (alexander.olshanskiy@vanderbilt.edu), 1326 Stevenson Center, Department of Mathematics, Vanderbilt University, Nashville, TN 37240. *Derivation space and computation space in semigroups and groups.*

We introduce the space function $s(n)$ of a finitely presented semigroup $S = \langle A \mid R \rangle$. To define $s(n)$ we consider pairs of words w, w' over A of length at most n equal in S and use relations from R for the derivations $w = w_0 \rightarrow \cdots \rightarrow w_t = w'$; $s(n)$ bounds from above the lengths of the words w_i -s at intermediate steps, i.e., the space sufficient to implement all such transitions $w \rightarrow \cdots \rightarrow w'$. One of the results obtained is the following criterion: A finitely *generated* semigroup S has decidable word problem of polynomial space complexity if and only if S is a subsemigroup of a finitely *presented* semigroup H with polynomial space function. Similar results for groups were obtained by the author earlier although in the group case, an extended set of transformations was used in the definition of derivation. (Received November 27, 2011)