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Analogies of Lie Group Concepts in S^7 and the Space of Commuting Pairs

The octonions, also known as Cayley numbers, has a norm-preserving multiplication. The unit octonions S^7 is an H-space which is not a Lie group due to failure of associativity. We examine the extent to which S^7 does or does not have analogies to Lie group concepts such as maximal torus, Weyl group, etc. Moreover, we give an explicit description of the centralizer of elements of S^7 and use it to compute the homology of the space of commuting pairs $\{(x, y) \in S^7 \times S^7 : xy = yx\}$.