

Classification of Heisenberg subalgebras

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A partial classification of integrable differentiable equations can be obtained from the representation theory of affine Lie algebras. The vertex operator realisations of the algebras, based upon the maximal Heisenberg subalgebras, play an essential part in this approach. The classification of the maximal Heisenberg subalgebras of an affine Lie algebra $\mathfrak{g}^{(\kappa)}$, $\kappa = 1, 2, 3$, is well known for the untwisted algebras $\mathfrak{g}^{(1)}$. For these cases a set of Heisenberg subalgebras of a given affine Lie algebra, distinct up to isomorphism of graded Lie algebras, is determined by the conjugacy classes of the Weyl group for the simple complex Lie algebra \mathfrak{g} . Realisations of an affine Lie algebra $\mathfrak{g}^{(\kappa)}$ involve the central extensions of loop algebras twisted by finite order automorphisms of \mathfrak{g} . In this communication I report on work accepted for publication in *J. Algebra*, and some more recent results, which extends the classification of maximal Heisenberg subalgebras to all the affine Lie algebras and also to all the realisations of a given affine Lie algebra determined by finite order automorphisms of \mathfrak{g} .