On a 9-dimensional family of Naturally Graded non p-filiform Lie Algebras *

L.M. Camacho† J.R. Gómez† A.J. González†

February 13, 2004

Abstract

The knowledge of the naturally graded algebras among those of a given class of Lie algebras offers essential information about the structure of the class.

So far, the classification of naturally graded Lie algebras is only known for some families of p-filiform Lie algebras [4], [2], [1]. In certain sense, if $\mathfrak{g}$ is a naturally graded Lie algebra of dimension n, the first case of non p-filiform Lie algebras occurs when the characteristic sequence is $(n-3, 2, 1)$. We offer the classification of these algebras in dimension 9. There is a technical parameter, r, which in this case must be $r = 1, 3, 5$. For $r = 1$, we obtain two pairwise non isomorphic Lie algebras (this case is solved in arbitrary finite dimension [3]). For $r = 5$ there is one single algebra. The most difficult case is for $r = 3$. We obtain two pairwise non isomorphic Lie algebras and an uniparameter family of pairwise non isomorphic Lie algebras of laws $\mu(\alpha)$ where $\mu(\alpha) \simeq \mu(\alpha')$ if $\alpha' = \pm\alpha$ or $\alpha' = \pm i\sqrt{\frac{4+3\alpha^2}{3+2\alpha^2}}$.

References

[1] J.M. Cabezas, J.R. Gómez, E. Pastor, *Naturally graded 3-filiform Lie algebras*, submitted to Journal of Pure and Applied Algebra.

[2] J.R. Gómez, A. Jiménez-Merchán, *Naturally graded quasifiliform Lie algebras*, Journal of Algebra, 256, 211-228, 2002.

[3] A.J. González, *Graduaciones naturales de una familia de álgebras de Lie no p-filiforme*, Minor Thesis, University of Seville, 2003.

[4] M. Vergne, *Cohomologie des algèbres de Lie nilpotentes. Application à l'étude de la varieté des algèbres de Lie nilpotentes*, Bull. Soc. Math. France,98, 81-116,1970.

*This paper has been partially supported by the PAICYT, of Junta de Andalucía (Spain), and by the Ministerio de Ciencia y Tecnología (Spain), ref. BFM 2000-1047

†Dpto. Matemática Aplicada I. Univ. Sevilla. Avda. Reina Mercedes S.N. 41012 Sevilla (Spain). E-mail: lcamacho@us.es - jrgomez@us.es - agonzalez@us.es