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Integrability and zero-Hopf bifurcation in the Sprott A system

Luis Barreira^a, Jaume Llibre^{b,*}, Claudia Valls^a

^a Departamento de Matemática, Instituto Superior Técnico, Universidade Técnica de Lisboa, Av. Rovisco Pais 1049-001, Lisboa, Portugal

^b Departament de Matemàtiques, Universitat Autònoma de Barcelona, 08193 Bellaterra, Barcelona, Catalonia, Spain

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ABSTRACT

The first objective of this paper is to study the Darboux integrability of the polynomial differential system

$$\dot{x} = y, \quad \dot{y} = -x - yz, \quad \dot{z} = y^2 - a$$

and the second one is to show that for $a > 0$ sufficiently small this model exhibits one small amplitude periodic solution that bifurcates from the origin of coordinates when $a = 0$. This model was introduced by Hoover as the first example of a differential equation with a hidden attractor and it was used by Sprott to illustrate a differential equation having a chaotic behavior without equilibrium points, and now this system is known as the Sprott A system.

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* Corresponding author.

E-mail addresses: barreira@math.ist.utl.pt (L. Barreira), jlllibre@mat.uab.cat (J. Llibre), cvals@math.ist.utl.pt (C. Valls).