

# ON THE INTEGRABILITY OF VECTOR FIELDS IN $\mathbb{R}^N$

JAUME LLIBRE<sup>1</sup>, RAFAEL RAMÍREZ<sup>2</sup> AND VALENTÍN RAMÍREZ<sup>3</sup>

ABSTRACT. We give necessary and sufficient conditions for the integrability of first order  $N$ -dimensional differential systems.

We propose a new method to determine the last  $N - 1$  first integral for the completely integrability of an  $N$  dimensional differential system with  $N - 2$  independent first integrals and with a Jacobi multiplier.

As an application we study the integrability of the asymmetric and symmetric May–Leonard differential systems with one first integral and one Jacobi multiplier. We determine the structure of the second independent first integral.

<sup>1</sup> DEPARTAMENT DE MATEMÀTIQUES, UNIVERSITAT AUTÒNOMA DE BARCELONA, 08193 BELLATERRA, BARCELONA, CATALONIA, SPAIN.

*E-mail address:* `jllibre@mat.uab.cat`

<sup>2</sup> DEPARTAMENT D'ENGINYERIA INFORMÀTICA I MATEMÀTIQUES, UNIVERSITAT ROVIRA I VIRGILI, AVINGUDA DELS PAÏSOS CATALANS 26, 43007 TARRAGONA, CATALONIA, SPAIN.

*E-mail address:* `rafaelorlando.ramirez@urv.cat`

<sup>2</sup> DEPARTAMENT DE MATEMÀTIQUES, UNIVERSITAT AUTÒNOMA DE BARCELONA, 08193 BELLATERRA, BARCELONA, CATALONIA

*E-mail address:* `valentin.ramirez@e-campus.uab.cat`