

# COLOQUIO DE ANÁLISIS Y FÍSICA–MATEMÁTICA

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## EXPLICIT SOLUTIONS TO THE KORTEWEG–DE VRIES EQUATION ON THE HALF LINE

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### Abstract

We analyze the Korteweg–de Vries equation on the half line  $u_t + \eta u_x - 6uu_x + u_{xxx} = 0$ , where  $\eta$  is a nonnegative constant,  $x \geq 0$ , and  $t \geq 0$ . We obtain certain explicit solutions in terms of elementary function; such solutions contain those that are global in time (i.e. valid for all  $t \in [0, +\infty)$ ) and also those local in time (i.e. valid for  $t \in [0, \tau)$  for some positive  $\tau$ ). The initial values of these solutions are associated with rational scattering data for the related Schrödinger equation.

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## A BALANCE OF KINETIC AND POTENTIAL ENERGIES IN THE SEMICLASSICAL LIMIT

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### Abstract

One considers a bound state of a quantum particle in a potential well. The goal is to find a limit of the kinetic (or potential) energy as the Planck constant tends to zero.

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## SCATTERING THEORY FOR NON–LINEAR SCHRÖDINGER EQUATIONS

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*23 de enero de 2006.*



## THE SAARI PROBLEM FOR MECHANICAL SYSTEMS WITH SYMMETRY

**Dr. Jeffrey Lawson**

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## **Abstract**

Saari's Conjecture states that an  $N$ -body system ( $N$  point particles mutually attracted by Newtonian potentials) has a constant moment of inertia if and only if the system is in relative equilibrium. J. Marsden suggested that Saari's Conjecture may be extended to more general dynamical systems with symmetry, but in recent literature there have appeared non-Newtonian  $N$ -body arrangements that would contradict a more general Saari's Conjecture.

A. Hernández, J. Lawson, and Marsden found a novel counterexample to Marsden's conjecture in the case of a free rigid body in 3 dimensions. This counterexample motivated an appropriate refinement of the conjecture by interpreting the moment of inertia using the locked inertia tensor. We can now claim that mechanics on any free Lie group constitutes a solution to the "Saari Problem".

In recent work with C. Stoica, we consider a simple mechanical system with symmetry using Palais slices in a neighborhood of a point of trivial isotropy (with respect to the group action). The relationship between the constancy of the locked inertia tensor and relative equilibria allow us to contribute more solutions to the Saari Problem, including the 3- and 4-body problems in 3 dimensions.

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