

Hamiltonian Mechanics unter besonderer Berücksichtigung der höheren Lehranstalten

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1 Fixed-Period Problems: The Sublinear Case

With this chapter, the preliminaries are over, and we begin the search for periodic solutions to Hamiltonian systems. All this will be done in the convex case; that is, we shall study the boundary-value problem

$$\begin{aligned}\dot{x} &= JH'(t, x) \\ x(0) &= x(T)\end{aligned}$$

with $H(t, \cdot)$ a convex function of x , going to $+\infty$ when $\|x\| \rightarrow \infty$.

1.1 Autonomous Systems

In this section, we will consider the case when the Hamiltonian $H(x)$ is autonomous. For the sake of simplicity, we shall also assume that it is C^1 .

We shall first consider the question of nontriviality, within the general framework of (A_∞, B_∞) -subquadratic Hamiltonians. In the second subsection, we shall look into the special case when H is $(0, b_\infty)$ -subquadratic, and we shall try to derive additional information.

The General Case: Nontriviality. We assume that H is (A_∞, B_∞) -subquadratic at infinity, for some constant symmetric matrices A_∞ and B_∞ , with $B_\infty - A_\infty$ positive definite. Set:

$$\gamma := \text{smallest eigenvalue of } B_\infty - A_\infty \quad (1)$$

$$\lambda := \text{largest negative eigenvalue of } J \frac{d}{dt} + A_\infty . \quad (2)$$

on the range of A , which is a subspace $R(A)_L^2$ with finite codimension. Here

$$N(x) := H(x) - \frac{1}{2} (A_\infty x, x) \quad (3)$$

is a convex function, and

$$N(x) \leq \frac{1}{2} ((B_\infty - A_\infty) x, x) + c \quad \forall x . \quad (4)$$

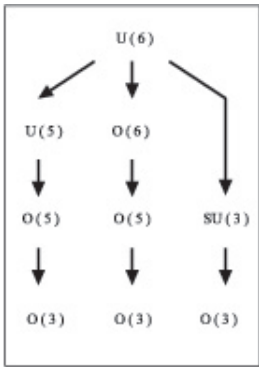


Fig. 1. This is the caption of the figure displaying a white eagle and a white horse on a snow field

Table 1. This is the example table taken out of *The T_EXbook*, p. 246

Year	World population
8000 B.C.	5,000,000
1980 A.D.	4,400,000,000

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