SYMPLECTIC MAPS

symplectic

n-

q, p,

$$\omega = p \wedge q. \tag{1}$$

(q_i, p_i), $i = 1, \ldots, n$,

$\omega(v, w)$ $F(q, p)$

$') = qp' + tH(q, p')$

$F = q' p' + p q$,

$$q' = q + t\frac{\partial H}{\partial p'}(q, p'), \quad p' = p - t\frac{\partial H}{\partial q}(q, p'). \tag{4}$$

S S

H

p'. , $H = K(p) + V(q)$

,

S

(., 1).

,

The Symplectic Group

$\{\ldots z_t, z_{t+1}, \ldots\}$

$z_{t+1} = f(z_t)$ J

f , $M = \prod_t Df(z_t)$.

f , M (2), $M^t J M = J$.

$2n \times 2n$

$Sp(2n)$. $n(2n+1)$-

JS S

t-

, $-I$. ,

( ).

(& S , 1)

M λ

M k, λ^{-1}.

$(M) = 1$, M

(λ, λ^{-1})

- *hyperbolic*, λ
- *hyperbolic with reflection*, λ
- *elliptic*, $\lambda = 2\pi\omega$
- *Krein quartet* λ

$(\lambda, \lambda^{-1}, \bar{\lambda}, \bar{\lambda}^{-1})$.

2 1 ().0 4 -1. 4 0)-2 4 1 () 1.142 10. 1 . ()

$m \cdot (0) \neq n$ … m … n.

C … , D (0), … (n-

… (1) …).

… 1 …

… n- …

… (… , 1 …)

… *beyond all orders*.

… $n = 1$. … $\mathbb{S} \times \mathbb{R}$ (…) … $\partial q'/\partial p \geq c > 0$. … ,

… ω. … ω … ,

… *Lipschitz graph*, $p = P(q)$,

… ω.

… (… *cantorus* …).

… (

2001). … , … (1 … 1) …

… (… & … , 1 … 2). …

… (a, b, c) (… ., 1 …).

See also **Aubry–Mather theory; Cat map; Chaotic dynamics; Constants of motion and conservation laws; Ergodic theory; Fermi acceleration and Fermi map; Hamiltonian systems; Hénon map; Horseshoes and hyperbolicity in dynamical systems; Lyapunov exponents; Maps; Measures; Melnikov method; Phase space; Standard map**

Further Reading

… , … 1 … *Mathematical Methods of Classical Mechanics*, …

… , … 1 … *Beam Dynamics: A New Attitude and Framework (The Physics and Technology of Particle and Photon Beams)*, …

… , … 2001. *Symplectic Twist Maps: Global Variational Techniques*, …

… , … 1 …

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