??
n

$$\frac{dx^{(1)}}{dt} = F_1(x^{(1)}, x^{(2)}, ..., x^{(n)}),$$
$$\frac{dx^{(2)}}{dt} = F_2(x^{(1)}, x^{(2)}, ..., x^{(n)}), \quad (1)$$

$$\frac{dx^{(n)}}{dt} = F_n(x^{(1)}, x^{(2)}, ..., x^{(n)}),$$

$$\frac{d\vec{x}(t)}{dt} = \vec{F}[\vec{x}(t)],$$
(2)

$\vec{x}$
n
t
$\vec{F}$
$\vec{x}$
$\vec{x}(0)$
$\vec{x}(t)$
$t > 0$
??
$n = 3$
$(x^{(1)}, x^{(2)} x^{(3)}$
$3d.pdf Orbit in three dimensional phase space$
$t = 1, 2, 3, ...$

$\vec{x}_{t+1} = \vec{M}(\vec{x}_t)$ (3)

$\vec{x}_t$
$\vec{x}_t = (x_t^1, x_t^2, ..., x_t^n)$
$\vec{M}$
$\vec{x}_t$
$\vec{x}_0$
$t = 1$
$\vec{x}_1 = \vec{M}(\vec{x}_0)$
$\vec{x}_1$
$t = 2$
$t = 1$
$\vec{x}_2 = \vec{M}(\vec{x}_1)$
$\vec{x}_0$
$\vec{x}_0, \vec{x}_1, \vec{x}_2, ...$
n
??
$n - 1$
$n = 3$
S
$x^3 = constant$
S
??
e
$(x_n^{(1)}, x_n^{(2)})$
n
$(x_{n+1}^{(1)}, x_{n+1}^{(2)})$
$n + 1$
N
$N - 1$
$H(p, q, t)$
p
q
N
N
$(p(t), q(t))$
$2N$

$$\frac{dp}{dt} = -\frac{\partial H(p, q, t)}{\partial q},$$
(4)