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Toric manifolds

Definition. Toric manifolds (M, ω, μ)

A [symplectic manifold](#) (M, ω) is a **toric manifold** if it is equipped with a faithful [Hamiltonian Lie group action](#) of a torus

$$T^{\dim M/2} \curvearrowright (M, \omega)$$

with the moment map

$$\mu : M \rightarrow \mathbb{R}^{\dim M/2}$$

The image of the moment map $\mu(M) \subseteq \mathbb{R}^{\dim M/2}$ is called the **Newton polytope** of (M, ω, μ) .

Motivation

Definition. Integrable Hamiltonian flows

Let (M, ω) be a symplectic manifold and

$$f_1, \dots, f_k \in \mathcal{C}^\infty(M)$$

such that

- *(independent)* $\mathrm{d}f_1, \dots, \mathrm{d}f_k$ are linearly independent on T_p^*M for all $p \in M$
- *(pairwise in involution)* $\{f_i, f_j\} = 0$ for $i, j \leq \dim M/2$

then

if	the flow of $f_1, \dots, f_{\max\{\dim M/2, k\}}$ is called
$k < \dim M/2$	(partially) k -integrable
$k = \dim M/2$	completely integrable
$k > \dim M/2$	super k -integrable
$k = \dim M$	maximally super-integrable

- classify toric manifolds by the polytopes
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And it has 20 siblings.

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