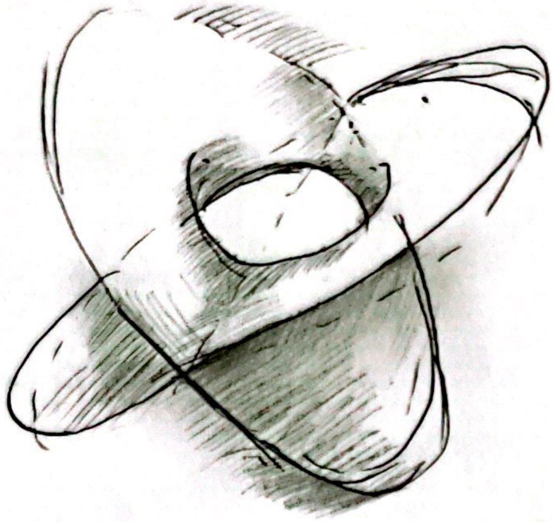
k3 surfece.



- The Milnor number of the singularity.
- A "deformarism" $f^{-1}(s) \to f^{-1}(0)$ $(s \neq 0)$ and the poincare duality.

- The Picard / transcendetal lattice of the family k3 surface. 代数几何

Remark.

- The Milnor number of the singularity
- A "deformation" $f^{-1}(s) \to f^{-1}(0)$ $(s \neq 0)$.
  and the Poincare duality.
- The ~~Ho~~ Picard / transcendental lattice of the family.

Rk: Let: X be a simple k3 singularity

Thm 1.1.

There exists a quasi-homogeneous polynomial f with weight system, s.t.

$$X = (f = 0)$$

$$f \in \mathbb{C}[z_1 \ldots z_4]$$

$$f(\zeta^{q_1} z_1 \ldots \zeta^{q_4} z_4) = \zeta^{d} f(z_1 \cdots z_4).$$

$$d = q_1 + q_2 + q_3 + q_4$$

deg

Δ is reflexive $\iff$ the toric variety $\mathbb{P}_\Delta$ is fano (3 fold)

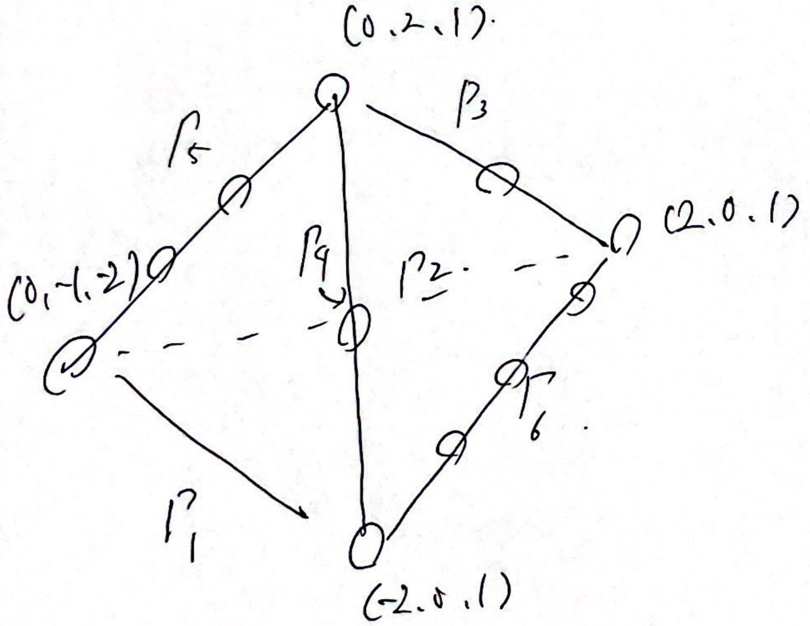
Belcastro

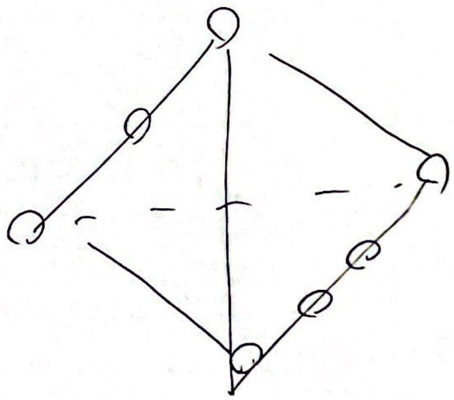
$f = W^3 + X^4 + Y^4 + Z^6$. (K3 singularity).

$w = (1/3, 1/4, 1/4, 1/6)$.

$N = \mathrm{lcm}(3, 4, 6) = 12$.

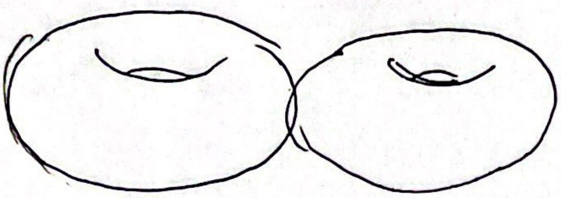
$(q_1, q_2, q_3, q_4) = (4, 3, 3, 2)$.

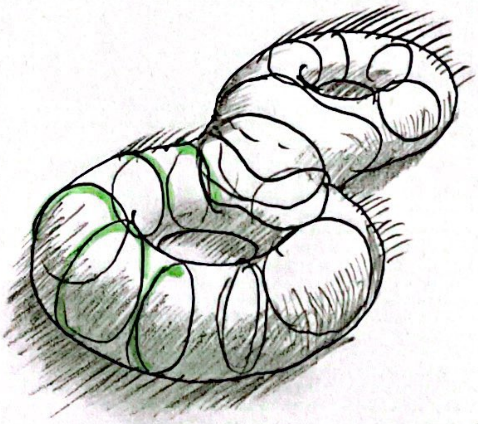


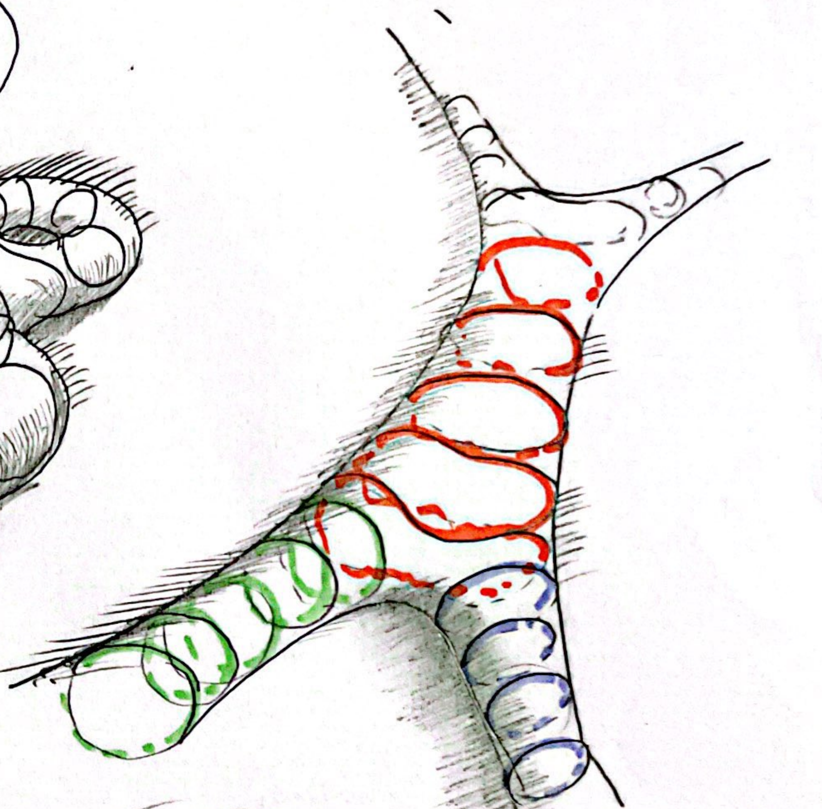


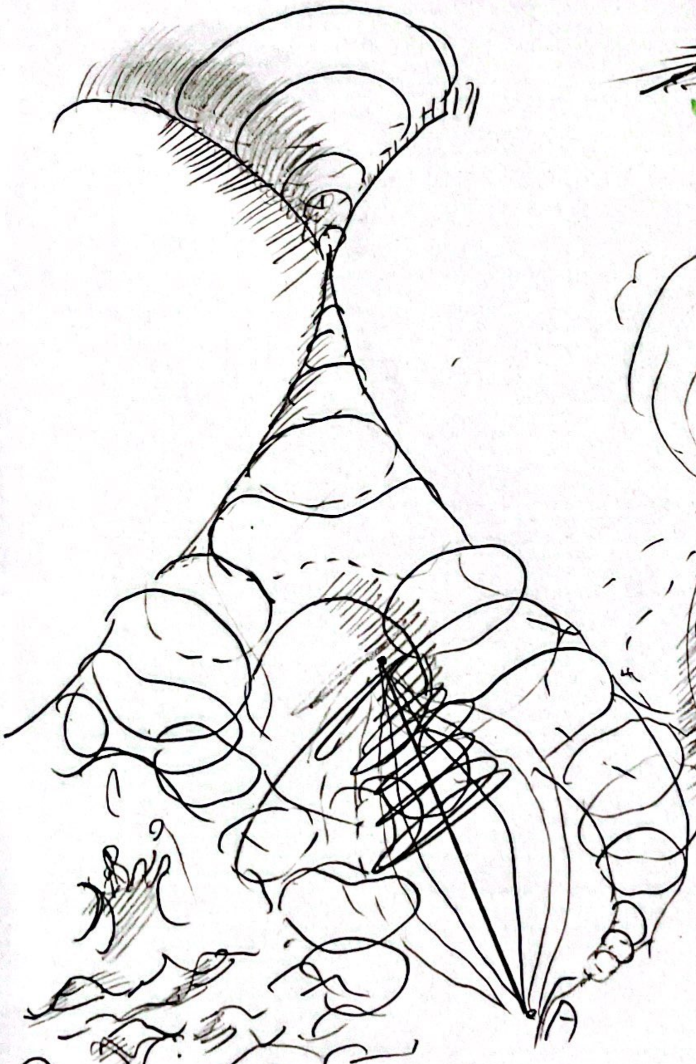
$U \oplus U(3) \oplus A_2 \oplus D_4$. sgn=(2,8)

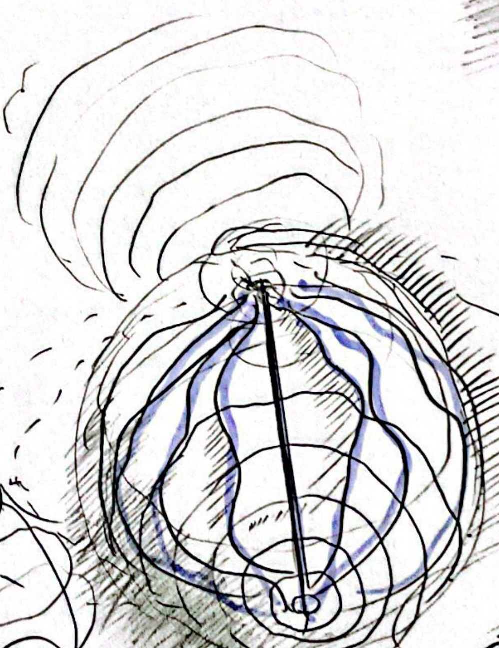
10

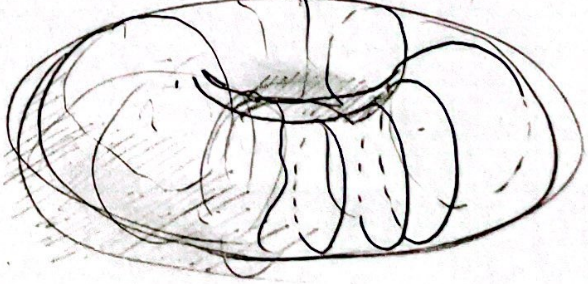






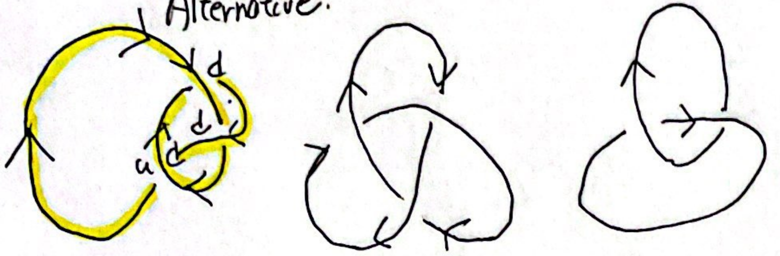






~~simple~~ Towards knot theory from random matrices.

Alternative.

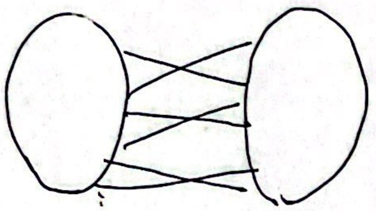


$$Z = \int e^{g\left(\sum_{i=1}^{N} \phi_i^2\right)^2 + \epsilon\sum \phi_i^2}$$

$$\int dH\, e^{-g\,\mathrm{tr} M^2} \left(\prod_j (\mathrm{tr}\, M^j)^{\lambda_j}\right)$$

$$\sim \int \prod^{N} (\lambda_i - \lambda_j)^2 e^{-g\sum \lambda_i^2} f$$

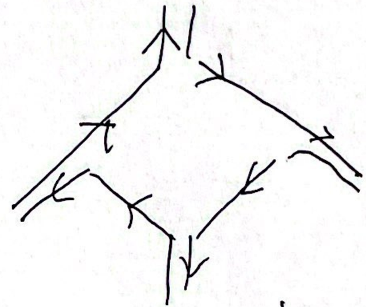
$\langle (\mathrm{tr}\, M^3)^2 \rangle$ $\quad \mathrm{tr}(M^3) = \mathrm{tr}(MMM).$



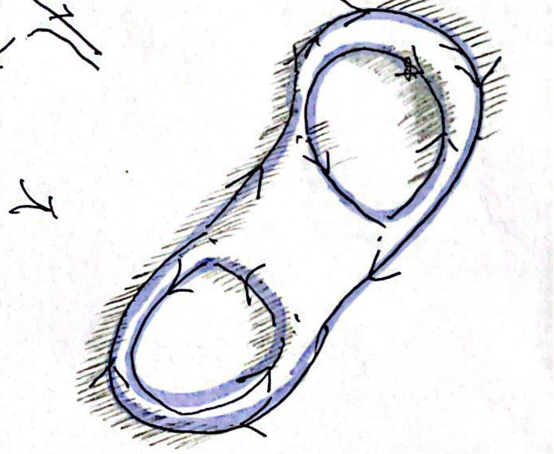
Circle or knot.

Gaussian Average.

$$\langle \mathrm{tr}\, M^4 \rangle = \langle \mathrm{tr}\, \underbrace{M \cdots M}_{4} \rangle$$



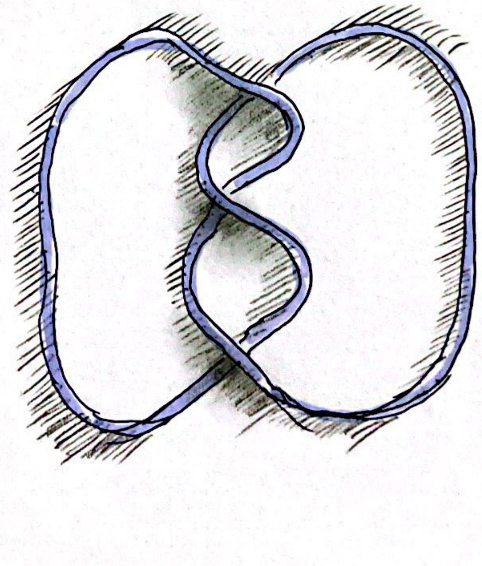
$$\lim_{N\to 0} \frac{1}{N} \langle \mathrm{tr}\, M^4 \rangle$$

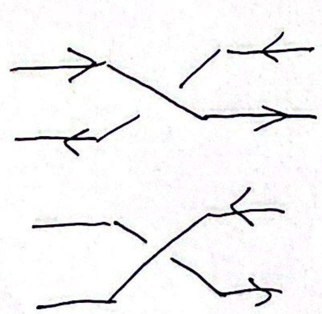


$$= \frac{1}{N} \langle \mathrm{tr}\, \underbrace{M \cdots M}_{4} \rangle$$

$$\sim (2N^3 + N)\frac{1}{N}$$

$$\sim 1.$$



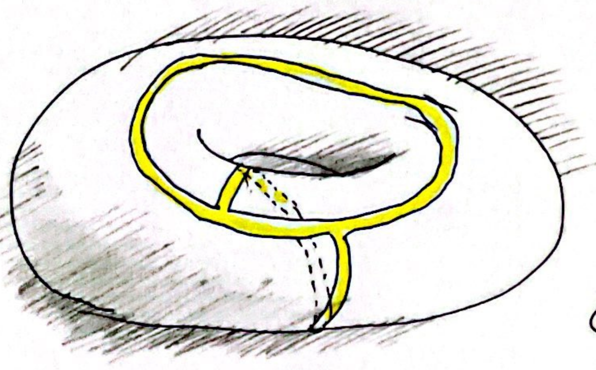


ud

du.

$Osp(n|2m)$

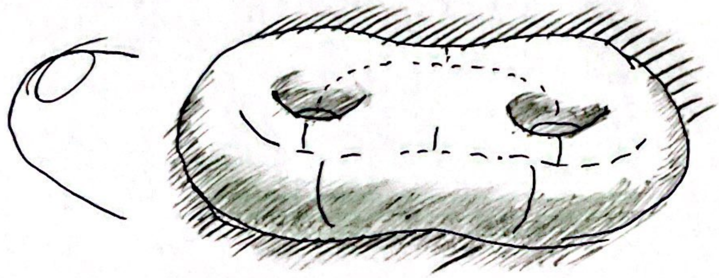
$\lim_{\lambda = m} SU(n|m).$



kontsevich.
ribbon graph.

$\langle (\mathrm{Tr} M^3)^2 \rangle = \frac{1}{24}$ $(g=1)$.

$\langle (\mathrm{Tr} M^3)^n \rangle = \frac{1}{2(24\cdot 24)^2}$ $(g=2)$.



$\oint du_1 \cdots \log(1-\frac{\sigma_1}{u})\cdots$

E. Brezin and SH

$$\frac{2^k}{x^2}\prod_{i=1}^{k} \sinh\left(\frac{x\sigma_i}{2}\right) = f(\sigma_1, \cdots, \sigma_k).$$

$$= \langle \mathrm{tr}\, e^{\sigma_1 M} \cdots \mathrm{tr}\, e^{\sigma_n M} \rangle$$