

**Meeting:** 1002, Pittsburgh, Pennsylvania, SS 9A, Special Session on Multivariate Hypergeometric Functions: Combinatorial and Algebro-Geometric Aspects

1002-14-75            **Go Okuyama\*** (`g-okuyama@math.sci.hokudai.ac.jp`), Department of Mathematics, Hokkaido University, 0600810 Sapporo, Japan. *The holonomic rank formula for  $A$ -hypergeometric system in the case where the rank of  $A$  is three.* Preliminary report.

Given a finite set  $A$  of  $d$ -dimensional integral vectors which belong to one hyperplane off the origin in  $\mathbb{Q}A$  and a parameter vector  $\beta \in \mathbb{C}^d$ , Gel'fand, Kapranov and Zelevinskii defined a system of differential equations, called an  $A$ -hypergeometric system  $M_A(\beta)$ . They proved that the holonomic rank of  $M_A(\beta)$  equals the normalized volume of the convex hull of  $A$  and the origin for any  $\beta$  when the semigroup ring  $\mathbb{C}[NA]$  determined by  $A$  is Cohen-Macaulay. Recently, Matusevich, Miller and Walther completely showed that the volume of  $M_A(\beta)$  is independent of  $\beta$  if and only if  $\mathbb{C}[NA]$  is Cohen-Macaulay. However, when we fix a parameter  $\beta$ , it is not well-known how the holonomic rank is described explicitly except when the convex hull of  $A$  is simplicial. In this talk, we introduce a homological and generalized notion of  $A$ -hypergeometric system, which is called Euler-Koszul complex by Matusevich, Miller and Walther. Moreover, we introduce some combinatorial terms, which may be powerful to investigate the holonomic rank and other  $D$ -invariants for this system. Using these notions, we provide the rank formula in the case where the rank of  $A$  is three. (Received August 30, 2004)