

## Summary of the previous studies

There are four kinds of forces in this world, electromagnetic force, gravitational force, strong force, and weak force. Two of these, electromagnetic force and weak force are described by the Weinberg-Salam theory. By the early 1970s, it was understood that these are described by the standard model except gravitational force. So, one seeks a principle that unifies four forces. The superstring theory is one of candidates.

However, the superstring theory has many types of perturbative theories, five types at least. Then, we want a non-perturbative theory, which is called the M-theory. The matrix model which is a formulation of the superstring theory is regarded as important frame for the M-theory.

Recently, Dijkgraaf and Vafa have made a striking conjecture. It implied that there is a connection between the supersymmetric gauge theory and the matrix model. Motivated by this conjecture, Cachazo, Douglas, Seiberg, and Witten wrote a thesis which gave a evidence for the conjecture. (Let me call this thesis “CDSW”)

In CDSW, they applied the chiral ring of  $\mathcal{N} = 1$  supersymmetric gauge theory to the generalized Konishi anomaly and derived three loop equations. One of those equations is equal to a equation of the matrix model. That is the one which connects the gauge theory and the matrix model.

Itoyama and Kanno investigated the matrix model. They employed the supereigenvalue model and use the Virasoro constraints. The supereigenvalue model is a model to overcome difficulties of the supersymmetric matrix model, and the Virasoro constraints is a condition which the matrix model must obey. They derived three loop equations. These takes the same form as the set of three equations of CDSW. In my master’s thesis, I reviewed these two theses.

And I wrote a thesis (arXiv:hep-th/0409060) which have relevance to CDSW.