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When Nekrasov partition function meets 5-brane web with O5-plane in the thermodynamic limit

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In this paper, we study 5d N = 1 Sp(N) gauge theory with N_f flavors based on 5-brane web diagram with O5-plane. On the one hand, we discuss Seiberg-Witten curve based on the dual graph of the 5-brane web with O5-plane. On the other hand,we compute the Nekrasov partition function based on the topological vertex formalism with O5-plane. Rewriting it in terms of profile functions, we obtain the saddle point equation for the profile function after taking thermodynamic limit. By introducing the resolvent, we derive the Seiberg-Witten curve and its boundary conditions as well as its relation to the prepotential in terms of the cycle integrals. They coincide with those directly obtained from the dual graph of the 5-brane web with O5-plane. This agreement gives further evidence for mirror symmetry which relates Nekrasov partition function with Seiberg-Witten curve in the case with orientifold plane and shed light on the non-toric Calabi-Yau 3-folds including D-type singularities.

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