

AIM Workshop
Recursion structures in topological string theory and enumerative geometry
June 8–12, 2009
Open Problem List

1. What is the Lax pair (integrable system) coming from the toric Calabi-Yau 3-fold matrix model? [Eynard]
2. Can you remove the spectral curve from topological recursion?
Proposal: Compute the inverse Laplace transform on topological recursion [Bouchard]
3. Generalize topological recursion to Gromov-Witten of other targets beyond C-Y 3-fold. [Ruan]
4. If you have a topological recursion or “GW theory like thing,” can you associate a (class of) spectral curves? [Mulase]
Can this be refined to a mathematical statement? e.g. axiomatize topological recursion. [Ruan]
5. What does topological recursion calculate for an arbitrary family of spectral curves? Do the $W_n^{(g)}$ compute/count some geometric (i.e. physical or combinatorial) quantity? Is there an associated Cohomological Field Theory? [Borot]
Can you construct a mirror to a plane curve? [Ruan]
What are the conditions for a curve to be spectral?
6. What is the matrix model for refined topological vertex? [Eynard]
Is there a topological recursion for orbifold vertex? [Tsang and Bryan]
7. Develop a mathematical treatment of {modular properties} \longleftrightarrow {wall crossings}
The closed toric case has been announced by Coates and Iritani, but the case of open strings is still open.
8. What is the non-perturbative completion? i.e. can divergent g -expansions be added up, and what is the interpretation? Are there any global analytic properties of partition functions? [Eynard]
9. From Virasoro, can we recover the spectral curve? (since topological recursion always implies Virasoro) [Mulase]
10. What is topological recursion for real Gromov-Witten theory (orientifolds)?