Wang, Gehao

From Kontsevich-Witten to linear Hodge integrals via Virasoro operators. (English)

Zbl 1408.37125
J. Math. Phys. 59, No. 12, 123502, 12 p. (2018).

Summary: We give a proof of Alexandrov’s conjecture on a formula connecting the Kontsevich-Witten and Hodge tau-functions using only the Virasoro operators. This formula has been confirmed up to an unknown constant factor. In this paper, we show that this factor is indeed equal to one by investigating series expansions for the Lambert W function on different points.

©2018 American Institute of Physics

MSC:

37K30 Relations of infinite-dimensional Hamiltonian and Lagrangian dynamical systems with infinite-dimensional Lie algebras and other algebraic structures
37K20 Relations of infinite-dimensional Hamiltonian and Lagrangian dynamical systems with algebraic geometry, complex analysis, and special functions
81R10 Infinite-dimensional groups and algebras motivated by physics, including Virasoro, Kac-Moody, W-algebras and other current algebras and their representations
37K10 Completely integrable infinite-dimensional Hamiltonian and Lagrangian systems, integration methods, integrability tests, integrable hierarchies (KdV, KP, Toda, etc.)
35Q55 NLS equations (nonlinear Schrödinger equations)
14C30 Transcendental methods, Hodge theory (algebra-geometric aspects)
17B68 Virasoro and related algebras
41A58 Series expansions (e.g., Taylor, Lidstone series, but not Fourier series)

Keywords:
Alexandrov’s conjecture; Kontsevich-Witten-Hodge tau-functions

Full Text: DOI arXiv

References:

[1] Alexandrov, A., From Hurwitz numbers to Kontsevich-Witten tau-function: A connection by Virasoro operators, Lett. Math. Phys., 104, 1, 75-87, (2014) · Zbl 1342.37066 · doi:10.1007/s11005-013-0655-0
[2] Alexandrov, A., Enumerative geometry, tau-functions and Heisenberg-Virasoro algebra, Commun. Math. Phys., 338, 195-249, (2015) · Zbl 1344.14032 · doi:10.1007/s00220-015-2379-8
[3] Corless, R. M.; Gonnet, G. H.; Hare, D. E. G.; Jeffrey, D. J.; Knuth, D. E., On the Lambert W function, Adv. Comput. Math., 5, 329-359, (1996) · Zbl 0863.65008 · doi:10.1007/bf02124750
[4] Date, E.; Jimbo, M.; Kashiwara, M.; Miwa, T., Transformation groups for soliton equations-Euclidean Lie algebras and reduction of the KP hierarchy, Publ. Res. Inst. Math. Sci., 18, 1077-1110, (1982) · Zbl 0571.35103 · doi:10.2977/prims/1195183297
[5] Ding, X. M.; Li, Y.; Meng, L., From r-spin intersection numbers to Hodge integrals, J. High Energy Phys., 2016, 15 · Zbl 1388.81129 · doi:10.1007/jhep01(2016)015
[6] Faber, C.; Pandharipande, R., Hodge integrals and Gromov-Witten theory, Invent. Math., 139, 1, 173-199, (2000) · Zbl 0960.14031 · doi:10.1007/s002229900028
[7] Givental, A., Gromov-Witten invariants and quantization of quadratic Hamiltonians, Moscow Math. J., 1, 551-568, (2001) · Zbl 1008.53072
[8] Guo, S.; Wang, G., Virasoro constraints and polynomial recursion for the linear Hodge integrals, Lett. Math. Phys., 107, 4, 757-791, (2017) · Zbl 1360.81202 · doi:10.1007/s11005-016-0923-x
[9] Karamata, J., Sur quelques problèmes posés par Ramanujan, J. Indian Math. Soc., 24, 343-365, (1960) · Zbl 0217.32101
[10] Kazarian, M., KP hierarchy for Hodge integrals, Adv. Math., 221, 1-21, (2009) · Zbl 1168.14006 · doi:10.1016/j.aim.2008.10.017
[11] Kontsevich, M., Intersection theory on the moduli space of curves and the matrix Airy function, Commun. Math. Phys., 147, 1-23, (1992) · Zbl 0756.35081 · doi:10.1007/bf02099526
[12] Lauwerier, H. A., The asymptotic expansion of the statistical distribution of N. V. Smirnov, Z. Wahrscheinlichkeitstheorie Verw. Geb., 2, 61-68, (1963) · Zbl 0134.36801 · doi:10.1007/bf00535298
[13] Liu, X.; Wang, G., Connecting the Kontsevich-Witten and Hodge Tau-functions by the $\hat{G L(\infty)}$ operators, Commun. Math. Phys., 346, 1, 143-190, (2016) · Zbl 1418.37117 · doi:10.1007/s00220-016-2671-2

[14] Marsaglia, G.; Marsaglia, J. C. W., A new derivation of Stirling’s approximation to n!, Am. Math. Mon., 97, 9, 826-829, (1990) · Zbl 0786.05007 · doi:10.1080/00029890.1990.11995666

[15] Miwa, T.; Jimbo, M.; Date, E., Solitons: Differential Equations, Symmetries and Infinite Dimensional Algebras, (2000), Cambridge University Press: Cambridge University Press, Cambridge · Zbl 0986.37068

[16] Mumford, D.; Artin, M.; Tate, J., Towards enumerative geometry on the moduli space of curves, Arithmetic and Geometry, 271-328, (1983), Birkhäuser

[17] Witten, E., Two-dimensional gravity and intersection theory on moduli space, Surveys Differ. Geom., 1, 243, (1991) · Zbl 0757.53049 · doi:10.4310/sdg.1990.v1.n1.a5

[18] Wang, G., A connection between the Kontsevich-Witten and Brezin-Gross-Witten tau-functions

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.