

From exact-WKB towards singular quantum perturbation theory

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We explicitly describe a transition from an exact WKB formalism to the quantum perturbative regime for one-dimensional anharmonic potentials of the form $V(q) = (q^M + gq^N)$, with even powers $N > M > 0$ and $g > 0$. Mainly, we obtain the $g \rightarrow 0$ behaviors of some global spectral functions: zeta-regularized determinants and spectral zeta functions. As basic tool we use improper action integrals such as $\int_0^\infty [V(q) + \lambda]^{1/2} dq$, which we specify and compute through a classical version of zeta-regularization. This work has appeared in Publ. RIMS, Kyoto Univ. **40** (2004) 973–990.