The asymptotic expansions of the hypergeometric function with respect to parameter

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We consider the Gauss hypergeometric differential equation with a large parameter from the viewpoint of the exact WKB analysis. We introduce a large parameter η in the parameters of the Gauss hypergeometric equation as general linear forms of η. As is well known, the Gauss hypergeometric differential equation has a system of fundamental solutions in the neighborhood of the origin (u_1, u_5) which are expressed in term of hypergeometric functions. On the other hand, the Gauss hypergeometric differential equation with a large parameter has another system of fundamental solutions which are defined by Borel sums (Ψ_+, Ψ_-) of WKB solutions. We investigate linear relations which hold between (u_1, u_5) and (Ψ_+, Ψ_-). By using these relations, we give asymptotic expansion formulas for the hypergeometric function with respect to the large parameter.

This is a collaboration with Takahi Aoki and Toshinori Takahashi.