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Asymptotic behavior of varying discrete Sobolev orthogonal polynomials

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Discrete Sobolev (or Sobolev type) orthogonal polynomials have been widely studied in the literature (see, for example, the latest survey (cf. [1])). The contribution of this poster to this topic comes from the fact of considering a varying Sobolev inner product

$$(f,g)_S = \int f(x)g(x)d\mu + M_n f^{(j)}(c)g^{(j)}(c), \quad c \in \mathbb{R},$$

where μ is a positive measure supported on the real line and its support can be either bounded or unbounded, and $\{M_n\}_n$ is a sequence of nonnegative numbers satisfying a very general condition about its asymptotic behavior. Asymptotic properties of the orthogonal polynomials with respect to the above inner product have been given for particular cases of the measure μ, for example see (cf. [2]) for Jacobi case. Now, strongly inspired by the techniques developed in (cf. [3]), we can obtain the Mehler–Heine type asymptotics which is a very relevant asymptotics for this type of discrete Sobolev orthogonal polynomials. As expected these Mehler–Heine formulae depend on the size of the sequence $\{M_n\}_n$. In addition, other asymptotic behaviors are provided.

References

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