

# ON $\beta$ -ENSEMBLES FOR LARGE $\beta$ AND HIGH DIMENSIONS

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## ABSTRACT

For the three classical  $\beta$ -matrix ensembles (Hermite, Laguerre, and Jacob) there exist central limit theorems for fixed  $N$  in the freezing regime  $\beta \rightarrow \infty$  with explicit formulas for the covariance matrices  $\Sigma(N)$  and their inverses  $\Sigma(N)^{-1}$ . These matrices are expressed in terms of the zeroes of the associated classical orthogonal polynomials of order  $N$ . We use the theory of dual orthogonal polynomials of de Boor and Saff to describe and analyze these formulas. We use this to derive asymptotic results for the variance of the smallest/largest eigenvalue in the freezing regime  $\beta \rightarrow \infty$  and then  $N \rightarrow \infty$ .

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