

• Exercises Lecture II

Study

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Spectrum of Dirac operator and role of winding number in QCD

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We show that very general considerations based on the properties of the partition function of QCD allow one to extract information about the eigenvalues of the Dirac operator in vacuum gauge fields. In particular, we demonstrate that the familiar suppression of field configurations with a nontrivial topology occurring for small quark masses is a finite size effect which disappears if the four-dimensional volume V is large enough. The formation of a quark condensate is connected with the occurrence of small eigenvalues of order $\lambda_n \propto 1/V$.

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• Verify (4.1) - (4.4)

• Verify (9.6)