

Assignment #3

*Due: Thursday, October 8**Sanjeev Arora*

Please be succinct, and give a proof sketch rather than gory details.

1. Use Matlab to generate a random symmetric $n \times n$ matrix whose entries are ± 1 , and plot its eigenvalues and pictorially verify the semicircle law. Then change your program to change the entries so that the matrix is more sparse and see how the eigenvalues change. Then plant a clique of size k and test how large k has to be before the eigenvalues shift noticeably. Finally, do the same experiment with a dense subgraph of size k and see if the eigenvalues shift for a different value of k .

Note that if you are using too many lines of code then you havent absorbed the matlab spirit!

2. In class we discussed an algorithm for recovering planted cliques. Modify the algorithm for planted bisection and report how good parameters you can get (in terms of the expected difference between the density of the bisection and the density of the two sides that still allows the algorithm to work).