UNIVERSITÄT DES SAARLANDES
FACHRICHTUNG 6.1 – MATHEMATIK
Prof. Dr. Roland Speicher
M.Sc. Felix Leid

Assignments for the lecture on
Random Matrices
Winter term 2019/20

Assignment 11
Hand in on Monday, 27.01.20, Mailbox 040.

Exercise 1 (10 points).
Read the notes "Random Matrix Theory and its Innovative Applications" by A. Edelman and Y. Wang,

`http://math.mit.edu/~edelman/publications/random_matrix_theory_innovative.pdf`

and implement its "Code 7" for calculating the Tracy-Widom distribution (via solving Painleve equation) and compare the output with the histogram for the rescaled largest eigenvalue for the GUE from Assignment 9, Exercise 1.

Exercise 2 (10+5* points).
For $N = 100, 1000, 5000$ plot in the complex plane the eigenvalues of one $N \times N$ random matrix $\frac{1}{\sqrt{N}} A_N$, where all entries (without symmetry condition) are independent and identically distributed according to the

(i) standard Gaussian distribution;

(ii) symmetric Bernoulli distribution;

*(iii) Cauchy distribution.