

General Mathematics and CPS II

Exercise 11

March 21, 2012

1. Kac ring paper, Exercise 5.
2. Consider an ensemble of Kac rings with N sites where each site is colored black independently with probability ν . Show that

$$\langle \Delta \rangle = (2\nu - 1) N$$

and

$$\text{Var}[\Delta] = 4\nu(1 - \nu) N.$$

Hint: Use the result of Question 4 on the last exercise sheet.

Remark: This is in fact a direct consequence of a well known result on the variance of the binomial distribution which has a rather elegant proof in terms of *moment generating functions*. These are usually introduced in a first course on probability theory. You will likely encounter them this semester in Engineering and Science Mathematics 2A/B.