Networks out of Control:
Homework Set 3

Exercise 1

Compute the (asymptotic) probability that $G(n, r)$ has clustering coefficient exactly 0. Conditionally on clustering coefficient 0, what is the (asymptotic) distribution of the number of 4-cycles?
For a definition of clustering coefficient see section 7.3 in the class notes.

Exercise 2

Complete the proof of $r$-connectivity of $G(n, r)$ for the case of large $a$ ($a > a_0$).

Exercise 3

If we sample from $G(n, p)$ and then condition on $G$ being $r$-regular, is this equivalent to sampling from $G(n, r)$? More precisely, is the conditional distribution over graphs given by $\mathbb{P}\{G = G(n, p) | G \text{ } r\text{-regular}\}$ the same as the distribution over regular graphs given by $\mathbb{P}\{G = G(n, r)\}$?
If no, give an example of a realization $G$ for which $\mathbb{P}\{G = G(n, p) | G \text{ } r\text{-regular}\} \neq \mathbb{P}\{G = G(n, r)\}$. If yes, then why do we not use this model to prove properties of $G(n, r)$?