Exercises Week 12

1. What is the probability that a random graph in $G(n, p)$ has exactly $m$ edges, for $0 \leq m \leq \binom{n}{2}$ fixed?

2. What is the expected number of $K_r$-subgraphs in $G \in G(n, p)$? What about $K_{1,3}$-subgraphs in $G \in G(n, p)$? And paths of size $k$?

3. Show that, for constant $p \in (0, 1)$, almost every graph in $G(n, p)$ has diameter 2.

4. Characterize the graphs that occur as a subgraph in every graph of sufficiently large average degree.

**Bonus Problem:** No bonus this week, study for the final!