1. Compute the expected value of the clustering coefficient $C(G)$ for an ER random graph $G \in G(n,p)$. Give also some estimates for the expected value of the characteristic path length $L(G)$.

2. Compute the clustering coefficient $C(G)$, characteristic path length $L(G)$, and distribution of node degrees for a circulant graph $C_{nk}$. (It suffices to compute these quantities asymptotically for fixed $k$ and large $n$.) What is the edge density $p = e(C_{nk})/\binom{n}{2}$ for such a graph? What is the effect on $L(G)$ of a single randomly added shortcut edge?

3. Compute the clustering coefficient $C(G)$, characteristic path length $L(G)$, and distribution of node degrees for a “caveman graph” consisting of $k$ “caves” of $r$ nodes each. What is the edge density $p$ for such a graph? (Recall that a “caveman graph” is a cyclic arrangement of $k$ appropriately modified $r$-cliques. It suffices to compute these quantities asymptotically for (a) fixed $r$ and large $k$ and (b) the case $r \sim k \sim \sqrt{n}$ for large $n.$)