T-79.5204 **Spring 2007**
Combinatorial Models and Stochastic Algorithms
Tutorial 9, March 29
Problems

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

2. Compute the clustering coefficient $\mathcal{C}(G)$, characteristic path length $\mathcal{L}(G)$, 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 $\mathcal{L}(G)$ of a single randomly added shortcut edge?

3. Compute the clustering coefficient $\mathcal{C}(G)$, characteristic path length $\mathcal{L}(G)$, 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.)