Assignment 2b

1) Consider the random graph $G(n,p)$ with mean degree $c$. Also consider that $S$ is the fraction of the network occupied by the giant component (20 pts).
   a. Calculate the probability that a vertex of degree $k$ belongs to a small component as a function of $S$.
   b. Show that the fraction of vertices in small components that have degree $k$ is $e^{-c} c^k (1-S)^{k-1} k!$.

2) The entropy $H$ of a probability distribution $p_i$, $i \in \{1, 2, ..., n\}$ is given by:
   $H(P) = -\sum_{i=1}^{n} p_i \log(p_i)$. Considering a network, its entropy is essentially the entropy of the corresponding degree distribution. Argue, quantitatively (preferred) or qualitatively, that if $G_1$ is a k-regular graph and $G_2$ is an Erdos-Renyi graph, that $H(G_1) < H(G_2)$. (20 pts)