1. In class we showed that for property B, if there is $p \in [0, 1]$ such that $k(1 - p)^n + k^2 p < 1$, then $m(n) > 2^{n-1} k$. Use this to show that $m(n) > C (\frac{n}{\log n})^{1/2} 2^{n-1}$.

2. Let $P, Q, R, S$ be uniformly and independently selected from the unit square. Let $f(\epsilon)$ be the probability that triangles $PQR$ and $QRS$ both have area less than $\epsilon$. Find the asymptotics of $f(\epsilon)$ (neglecting constant factors) as $\epsilon$ approaches zero.

3. Let $X$ be the number of triangles in $G(n, p)$ with $p = c/n$. Find the asymptotic $[c$ fixed, $n \to \infty$, in terms of $c]$ values for the expectation and variance of $X$.

4. Let $X$ be the number of isolated triangles in $G(n, p)$ with $p = c/n$. Find the asymptotic $[c$ fixed, $n \to \infty$, in terms of $c]$ value for the expectation of $X$. (A triangle $v, w, u$ is isolated if there are no other edges including any one of those three vertices.)

5. For $1 \leq i \leq n$ let $X_i$ be independent random variables with $\Pr[X_i = 1] = \frac{1}{i}$, $\Pr[X_i = 0] = 1 - \frac{1}{i}$. Set $Y_n = \sum_{i=1}^{n} X_i$. Find asymptotic formulas for $E[Y_n]$ and $Var[Y_n]$. Use Chebyshev’s Inequality to show that for any $\epsilon > 0$

$$\lim_{n \to \infty} \Pr[|Y_n - E[Y_n]| > \epsilon E[Y_n]] = 0$$