Combinatorial Analysis 21-301: Fall 2003
Homework.
HW9 due Monday 11/10/2003

Q1: Let A be a 0-1 $m \times n$ matrix. If $S \subseteq [n]$ then A_S is the $m \times |S|$ submatrix whose columns are the columns $A_i, i \in S$. A is said to be k-universal if every set S of k columns has the following property: Every vector in $\{0,1\}^k$ appears as a row of A_S.
Show that if $\binom{n}{k} 2^k \left(1 - \frac{1}{2^k}\right)^m < 1$ then there exists at least one k-universal matrix.

Q2: Let $p = (1+\epsilon)\frac{\log n}{n}$ where $\epsilon > 0$ is constant. Show that **whp** $G_{n,p}$ is 2-connected. (A graph is k-connected if removing any $k-1$ or less vertices leaves it connected.)