Math 301: Homework 3

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Complete the following problems. Fully justify each response.

1. Let A be an $n \times n$ array, in which the numbers 1 through n appear exactly n times each. Prove that there exists either a row or column in A in which appear at least $\sqrt{n}$ distinct numbers.
2. Prove Sperner's Theorem: If $\mathcal{F}$ is a collection of subsets of $[n]$, such that no set in $\mathcal{F}$ is contained in any other set in S, then $|\mathcal{F}| \leq \binom{m}{\lfloor m/2 \rfloor}$.