1. Prove: $R(3,4)=9$.
2. Let $m$ be given. Show that if $n$ is large enough, then every $n$-by-$n$ 0,1-matrix has a principal submatrix of size $m$ in which all elements above the diagonal are the same, and all elements below the diagonal are the same.
3. Prove that for every positive integer $k$ there exists an integer $n$ such that every set of $n$ points in the plane contains a subset of $k$ points, in which all points are on one line or alternatively no three points are on one line.
4. Let $G = (V, E)$ be a graph. Assume that every Red-Blue coloring of the edges of $G$ contains a Red copy of $K_s$ or a Blue copy of $K_t$. Prove: $\chi(G) \geq R(s, t)$, where $R(s, t)$ is the Ramsey number of $s$ and $t$.
5. Let $G = (V, E)$ graph with 1000 vertices and 250001 edges. Prove: $G$ contains two triangles sharing an edge.
6. 30 people need to place a call to each other using their cellular phones (one call per each pair). A cellular phone company gets 1 shekel for each call between two people at distance between 800 and 1000 meters. The company is allowed to locate the people as it wishes so as to maximize its profit. What is the maximum possible profit of the company?