MATH 309 HW 4.

There are four questions to answer.

**Question 1.** Let us suppose that a graph, $G_n$, has no triangle and the number of its edges is $4n$.

- Prove that $cr(G_n) \geq 2n$.
- Use the probabilistic method to give a better bound, $cr(G_n) \geq 2.37n$.

**Question 2.** Draw an arrangement of 9 lines and 10 points with 30 incidences.

**Question 3.** Given an arrangement of $n$ lines and $n$ points, $L, P$, such that most of the lines intersect outside of the convex hull of $P$. Out of the $\binom{n}{2}$ possible intersections only $n^{3/2}$ line pairs intersect inside the convex hull of $P$. Give a bound on the number of incidences, $I(P, L)$.

**Question 4.** Draw 7 unit circles (circles with radius one) and 7 points such that they determine 24 incidences.

Due date: Feb 14, in class.