HOMEWORK #5
Math 6014

Problem 9. Let $\{x_1, x_2, \ldots, x_n\}$ be a set of diameter 1 in the plane. Prove that the maximum possible number of pairs of points at distance greater than $1/\sqrt{2}$ is $\lfloor n^2/3 \rfloor$.

Problem 10. Let G be a non-bipartite graph on n vertices and strictly more $(n-1)^2/4+1$ edges. Prove that G has a triangle. Prove that for all odd $n \geq 5$ there is a triangle-free non-bipartite graph with exactly $(n-1)^2/4+1$ edges.
Hint. Delete two adjacent vertices and apply induction.

Instructions: You are only allowed to use your own notes, class handouts and the designated textbook. Clarity of exposition, ease of expression, mathematical elegance and overall physical appearance will all be factors in grading. This assignment is due before 3:05PM, Thursday, November 17, 2016.

Please type your solution on one-sided letter size paper in 10pt font or larger. Figures and mathematical formulae may be drawn by hand in black ink. Please submit your work as a single pdf file using the "Assignments" functionality on T-square. At the beginning of the file please include the following honor pledge (or an appropriate modification if you consulted other persons or used other sources):

"I pledge on my honor that this paper represents my own work. I have not consulted with anyone else during the work on this assignment, and I have not used any sources other than my own notes, class handouts and the designated textbook. I understand that making a false statement is a violation of the Georgia Tech honor code."